Energy Fuels Resources (USA) Inc.
225 Union Blvd. Suite 600
Lakewood, CO, US, 80228
303 974 2140
www.energyfuels.com

April 12, 2021

Via Electronic Mail and Express Delivery

Ms. Valerie Thorsen
Air Permits Unit Manager
Air Quality Division
1110 W. Washington St.
Phoenix, AZ 85007

Re: Class II Permit Renewal Application for the Pinyon Plain Mine, Permit No. 62877 (as Amended by No. 86356)

Dear Ms. Thorsen:

Energy Fuels Resources (USA) Inc. ("EFRI") operates the Pinyon Plain Mine (the "Mine") located 6.5 miles southeast of Tusayan, Arizona. The Mine's Class II Air Quality Permit #62877 (as amended by Amendment #86356) (the "Permit") is scheduled to expire on October 13, 2021. EFRI is submitting the attached permit application to renew the Permit in accordance with A.A.C. R18-2-304.C.2.

Operation of the Mine will remain consistent with the current permit. Please refer to the original Permit application submitted in April 2010, and the minor revision submitted in October 2012 for detailed project description, applicable requirements, facility flow diagram, and dispersion modeling analyses.

Potential to Emit emissions have changed slightly from the values included in Permit #62878 and have been updated in the mine's emission inventory. Additionally, an electronic emissions calculations file has been included with the electronic version submitted via e-mail.

Please contact me at 303-389-4132 or sbakken@energyfuels.com if you have any questions or need additional information.

Sincerely,

Scott Bakken Digitally signed by Scott Bakken
Date: 2021.04.12 17:13:46 -06'00'

ENERGY FUELS RESOURCES (USA) INC.
Scott A. Bakken
Vice President, Regulatory Affairs

Enc. ADEQ Class II Renewal Application

cc: D. Frydenlund, Kathy Weinel, D. Kolkman (EFRI), E. Farstad (CTEH)

ATTACHMENT A

CLASS II PERMIT RENEWAL APPLICATION FOR THE PINYON PLAIN MINE

Energy Fuels Resources (USA) Inc.

CLASS II PERMIT RENEWAL APPLICATION FOR THE PINYON PLAIN MINE

Submitted to:

Arizona Department of Environmental Quality
Air Quality Division
1110 West Washington Street
Phoenix, Arizona 85007

Submitted by:

Energy Fuels Resources (USA) Inc.
225 Union Blvd., Suite 600
Lakewood, CO 80228

Prepared by:

CTEH, LLC
1114 Washington Ave., Suite 201
Golden, CO 80401

April 12, 2021

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1.0 INTRODUCTION

Energy Fuels Resources (USA) Inc. (EFRI) is submitting this permit application to renew Class II Air Quality Permit #62877 (as amended by 86356) for the Pinyon Plain Mine (formerly called the Canyon Mine) located 6.5 miles southeast of Tusayan, Arizona. Operation of the mine will remain consistent with the current permit. Several minor adjustments to the mine's equipment and operations are incorporated into this renewal, as detailed in the application materials. None of the changes exceed the Permitting Exemption Thresholds given in Arizona Administrative Code (A.A.C.) R18-2-101.101, nor do all the changes cumulatively exceed the Permitting Exemption Thresholds.

Potential to Emit (PTE) emissions have changed slightly from the values included in Permit #62878 and have been updated in the mine's emission inventory. Please refer to the original Class II permit application submitted in April 2010 for detailed project description, applicable requirements, facility flow diagram, and dispersion modeling analyses. The electronic emission calculations file is also attached with this application package.

Appendices to this document complete the necessary information required as part of the permit renewal application and include:

Appendix A Permit Application Forms and Equipment List

Appendix B Emission Calculations

2.0 FACILITY DESCRIPTION

The Pinyon Plain Mine is located at Universal Transverse Mercator (UTM) coordinates 401,057 meters east and 3,971,533 meters north (North American Datum [NAD] 83, Zone 12). The location of the site in Coconino County is within an area that is currently classified as an attainment or unclassifiable area for air quality. The maximum annual production rate is 109,500 tons per year (tpy) of uranium ore. Access to the ore deposit is by a conventional vertical shaft located immediately northeast of the deposit.

Raises or incline workings within the mine connect the various levels within, or very near, the deposit. Sublevel workings are driven to extract ore from the deposit at various elevations from these levels. The broken ore is dropped down raises, designed for this use, collecting in drawpoints on the lowest level. The ore is then hauled to the shaft, where it is transferred to skips in the shaft and hoisted to the surface. Barren development rock generated during mining is removed and stockpiled on the surface in the Development Rock Area (DRA) (see Figure 3-1). Ore is stockpiled on the Ore Stockpile Area (OSA) until it is shipped to the off-site processing mill. If the ore cannot be shipped immediately to the mill, it is stored in the OSA. The OSA encompasses approximately 0.7 acres and can accommodate up to 13,100 tons of stockpiled ore.

Rock from the mining operations with less than 0.03 percent uranium is stored on the surface in the DRA and in mined-out areas of the underground workings. The DRA encompasses 1.54 acres. An existing topsoil pile is present on the site. It has been seeded and produces only minor dust emissions from wind erosion.

Power for the Pinyon Plain Mine is supplied via overhead electric lines. A diesel generator is used as a source of backup power in the event of power failure. The primary road into the site is the north-south National Forest Road 305A that connects with National Forest Road 305 four miles south of the site. This east-west road connects to State Highway 64 approximately 2 miles west of the 305/305A junction. On-site traffic within the Permit Area Boundary (PAB) occurs during mining operations to access the OSA, the DRA, storage tanks, and maintenance facilities. Surface equipment that routinely travels on on-site roads includes:

- Front-End Loaders
- Highway Ore Haul Trucks
- Water Truck
- Fuel Truck
- Pick-up Trucks

Fuel and other products may be stored on-site in above ground storage tanks (ASTs), drums, and smaller containers. The fueling station is located in the northwestern portion of the site and contains one 6,000-gallon diesel tank. Emissions from the diesel storage tank are included in the emission inventory (Table B -10). Note that the diesel storage tank was inadvertently referred to as a 4,000-gallon diesel tank in previous permit application materials. The storage tank is an insignificant activity per A.A.C. R18-2-101.68 and is therefore not listed in the permit. The tank size has been updated in the emission inventory included with this application.

One ventilation shaft is located on the site. This shaft is required under safety protocols for mine operations. Emissions of criteria pollutants are expected to be very low. Watering required under safety regulations (Mine Safety and Health Administration [MSHA] regulations at Title 30 Code of Federal Regulations [CFR] Part 57) also reduce potential emissions from mining (MSHA 2007).

3.0 SUMMARY OF FACILITY CHANGES

Since the Pinyon Plain Mine's 2016 permit renewal, a minor revision (#65899) was issued in 2017 to add a new evaporative water spray system (EWS) and an administrative amendment (#86356) was issued in 2020 to change the name of the mine from the "Canyon Mine" to the "Pinyon Plain Mine." After the 2017 minor revision, EFRI replaced the EWS Landshark evaporator fans with more efficient APEX 2.0 evaporator

fans. Both the Landshark fans and the APEX 2.0 fans are manufactured by Resource West Inc. (RWI). The change to more efficient fans resulted in a decrease in potential particulate emissions from the EWS. 10-micron particulate matter (PM_{10}) decreased from 1.98 tons per year (tpy) to 1.55 tpy and 2.5-micron particulate matter ($PM_{2.5}$) decreased from 1.55 tpy to 1.18 tpy.

Additionally, EFRI is planning several minor adjustments to the mine operation. These changes are described below:

1. The Ore Stockpile Area (OSA) will be moved to a location approximately 300 feet to the east of its current location to allow better access to haul trucks. The OSA will not have an increased area and therefore potential particulate emissions will not increase. The proposed OSA location is shown in Figure 3-1.

2. A small, portable 56-kilowatt (kW) diesel generator will be added to the mine site and will be used for well sampling activities and will be available for emergency power generation in the event of an emergency. This generator is a categorically exempt source based on R18-2-101.24.a. Its PTE emissions have been added to the facility emission inventory (Table B-5). Specifications for the generator are provided in Appendix C.

3. Several small propane space heaters totaling 60,000 British Thermal Units (Btu's) will be added to the mine site to provide heat during the winter months. The estimated usage is expected to be about 20,000 Btu/hr during winter months but the PTE emissions have been calculated based on maximum hourly and annual usage. These propane space heaters are also categorically exempt activities per R18-2-101.24.a because the combined power with the portable generator is less than 145 hp. Specifications for the space heaters are given in Appendix C.

4. A 350-gallon propane tank will be added to the site to provide propane for the space heaters described above. The propane tank is an insignificant activity per R18-2-101.68.a.iii. Maximum annual throughput for the propane tank will be approximately 5,750 gallons/year.

5. A 150-gallon diesel tote will be added to the mine site for use in fueling mining equipment. The diesel tote is an insignificant activity per R18-2-101.68.a.i. Emission estimates for the diesel tote have been added to the facility emission inventory (Table B-10).

6. A sulfuric acid storage tank will also be added to the mine site. Sulfuric acid will be used as part of a water treatment program. The storage tank (tote) will have a 275-gallon capacity and will be connected to a 75-gallon dosing tank. Any venting from the storage tank/dosing system will be routed into a drum with water and limestone for acid neutralization. Sulfuric acid mist is considered a non-conventional air pollutant by the Arizona Department of Environmental Quality (ADEQ). It is not a hazardous air pollutant. The permitting exemption threshold for sulfuric acid mist is 7 tons per year (tpy) of air emissions and applies to both major and minor sources (A.A.C. R18-2-101.131.B). Potential emissions have been estimated for this storage system and are

included in the emission inventory (Table B-17). Based on calculations, the potential sulfuric acid mist emissions will be negligible.

The cumulative emission increases from the six adjustments listed above are below all ADEQ Permitting Exemption Thresholds as detailed in Section 5.0. Therefore, minor New Source Review is not applicable.

4.0 INSIGNIFICANT ACTIVITIES

The proposed new equipment and/or activities are described above. The diesel generator and the propane heaters are categorically exempt activities. The 350-gallon propane tank and the 150-gallon diesel tote are insignificant activities.

5.0 SUMMARY OF FACILITY EMISSIONS

Sources of air emissions associated with the Pinyon Plain Mine include mine vent shaft emissions, diesel generators, propane heaters, small storage tanks, ore and development rock storage and handling, an evaporative water system, and other fugitive emissions. A summary of facility-wide PTE emissions for criteria air pollutants and greenhouse gases (GHGs) is given in Table 4-1. A summary of facility-wide PTE emissions for hazardous air pollutants (HAPs) is given in Table 4-2. PTE emissions increases shown in Tables 4-1 and 4-2 are well below the associated permitting exemption thresholds.

6.0 COMPLIANCE SCHEDULE

All existing sources are in compliance with applicable requirements. Therefore, a compliance schedule is not needed as part of this permit renewal application.

7.0 DRAFT PERMIT LANGUAGE

Should specific permit language be required for the portable 56-kW diesel generator, suggested draft permit language is provided below:

A. Engine Limitations

1. Fuel Limits

The Permittee shall only burn diesel fuel in the internal combustion engine identified in this section.

[A.A.C. R18-2-306.A.2]

2. Fuel Requirements

   a. The Permittee shall use diesel fuel that meets the requirements of non-road diesel fuel in 40 CFR 80.510(b) and listed below:

      1. Sulfur content: 15 ppm maximum; and

      2. A minimum cetane index of 40 or a maximum aromatic content of 35 volume percent.

[40 CFR 63.6604(b)]

3. Emission Limitations and Standards

   The Permittee shall comply with the emission standards listed in 40 CFR 1039.102.

4. Compliance Requirements

   The Permittee shall install and configure the engine according to the manufacturer's specifications.

5. Monitoring and Recordkeeping

   The Permittee shall maintain a copy of engine certifications or other documentation demonstrating that each engine complies with the applicable standards in this Permit, and shall make the documentation available to ADEQ upon request.

6. Permit Shield

   Compliance with the conditions of this Part shall be deemed compliance with 40 CFR 1039.

[A.A.C. R18-2-325]

In addition, the following changes to the current permit language in Attachment C of Class II Permit No. 62877 (As amended by 86356) are provided for consideration in the minor permit renewal. Changes are indicated by bold text.

ATTACHMENT "C": EQUIPMENT LIST

Equipment Type	Fuel Type	Maximum Capacity	Make	Model	Serial Number	Equipment ID	Date of MFG.
Emergency Generator	Diesel	455 kW	Caterpillar	C15 ATAAC	N/A	GEN455	2011
Nonroad Generator	**Diesel**	**56 kW**	**Isuzu**	**DCA-70SSIU2**	**7351630**	**GEN56**	**2009**
Evaporator Fan	**N/A**	**67 gpm**	**Resource West**	**APEX 2.0**	**APX2-18-023**	**APEX-023**	**2019**
Evaporator Fan	**N/A**	**67 gpm**	**Resource West**	**APEX 2.0**	**APX2-18-024**	**APEX-024**	**2019**
Evaporator Fan	**N/A**	**67 gpm**	**Resource West**	**APEX 2.0**	**APX2-19-HHXL**	**APEX-HHXL**	**2019**
Evaporator Fan	**N/A**	**67 gpm**	**Resource West**	**APEX 2.0**	**APX2-19-KZQH**	**APEX-KZQH**	**2020**

Figure 3-1 Site Plan

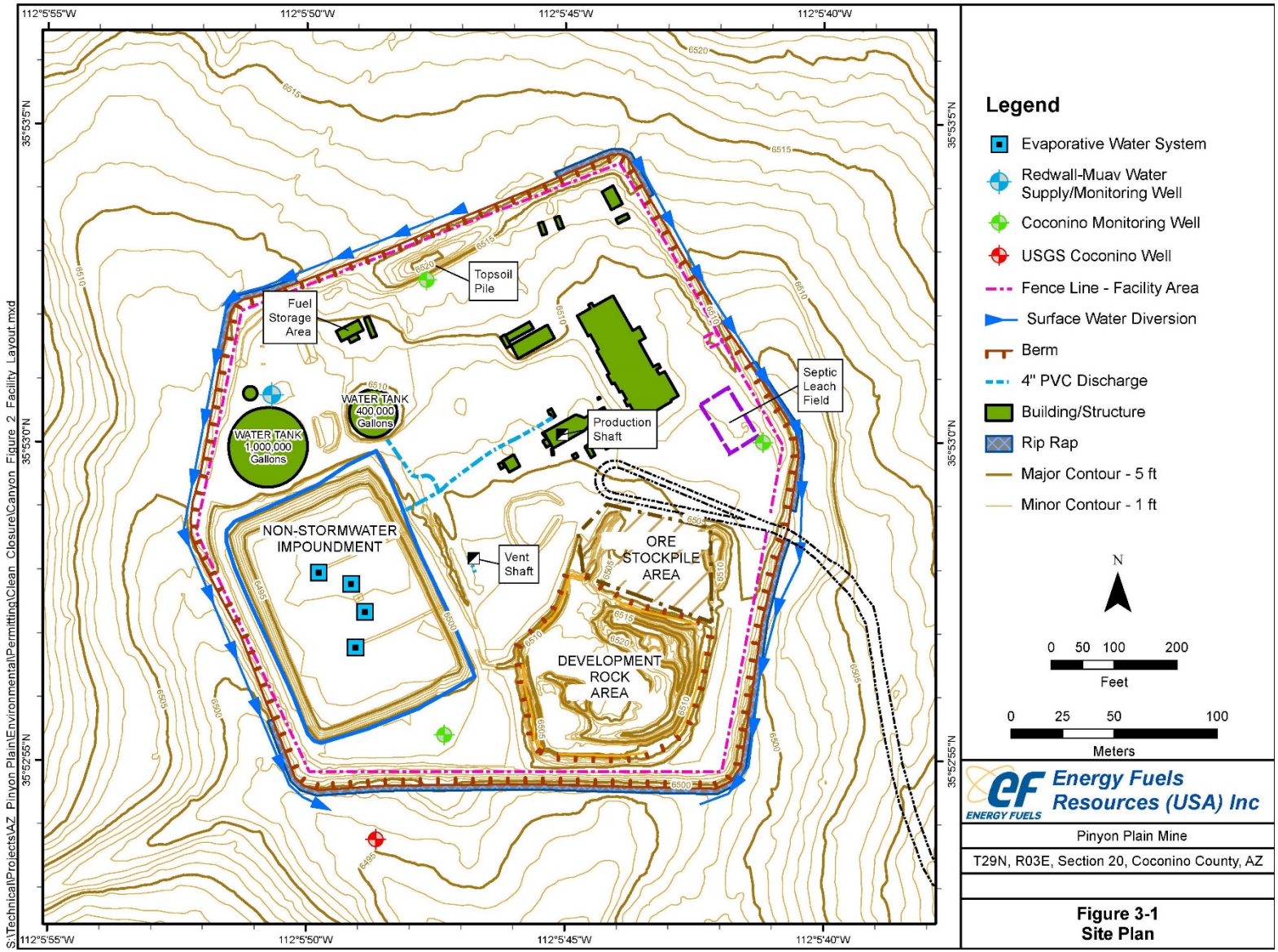


Table 4-1 Pinyon Plain Mine Facility-Wide Potential Annual Criteria Pollutant, Non-Conventional, and GHG Emissions

Pollutant	Generators	Propane Heaters	Vent Shaft	Material Handling Sources	Storage Piles	On-Site Road Fugitives	Storage Tanks	Evaporative Water System	Total	PTE Increase	Permitting Exemption Threshold
(tons per year)											
Criteria Pollutants											
CO	2.86	0.02	---	---	---	---	---	---	2.88	2.7	50
NO_X	2.57	0.04	---	---	---	---	---	---	2.61	2.4	20
$PM_{2.5}$	0.22	0.002	1.56	0.06	0.03	0.12	---	1.18	3.18	1.4	5
PM_{10}	0.22	0.002	1.56	0.42	0.21	1.17	---	1.55	5.12	1.9	7.5
VOC	0.17	0.003	---	---	---	---	0.001	---	0.17	0.1	20
SO2	0.004	5.8E-5	---	---	---	---	---	---	0.0042	0.0038	20
Lead	---	---	2.03E-05	5.4E-06	2.03E-5	---	---	---	2.8E-05	3.4E-7	0.3
Greenhouse Gases											
CO_2e	442	36.4	---	---	---	---	---	---	479.1	434.4	N/A
Non-Conventional Pollutants											
H_2SO_4	---	---	---	---	---	---	0	---	0	0	7

--- Emissions of the compound are either not present or were not reported in the literature reviewed.

N/A Not Applicable

Table 4-2 Pinyon Plain Mine Facility-Wide Potential Annual HAPs Emissions

Pollutant	Generators	Vent Shaft	Material Handling and Storage Piles	Storage Tank	Total
Naphthalene	7.75E-05	---	---	---	7.75E-05
Acetaldehyde	7.01E-04	---	---	---	7.01E-04
Acrolein	8.46E-05	---	---	---	8.46E-05
Benzene	8.53E-04	---	---	3.23E-05	8.85E-04
1,3-Butadiene	3.58E-05	---	---	---	3.58E-05
Ethyl benzene	---	---	---	4.02E-06	4.02E-06
Formaldehyde	1.08E-03	---	---	---	1.08E-03
Hexane	---	---	---	7.04E-05	7.04E-05
Toluene	3.74E-04	---	---	2.59E-05	4.00E-04
Xylenes	2.61E-04	---	---	1.63E-06	2.62E-04
Arsenic	---	7.17E-05	2.86E-05	--	1.00E-04
Lead	---	2.03E-05	8.08E-06	--	2.83E-05
Nickel	---	2.34E-05	9.32E-06	--	3.27E-05
Selenium	---	4.68E-06	1.86E-06	--	6.54E-06
Radionuclides	---	6.39E-03	6.85E-04	--	7.08E-03
TOTAL HAPs	**3.47E-03**	**6.51E-03**	**7.33E-04**	**1.34E-04**	**1.08E-02**

--- Emissions of the compound are either not present or were not reported in the literature reviewed.

8.0 REFERENCES

Mine Safety and Health Administration (MSHA) Department of Labor. 2007. 30CFR Part 57 – Safety and Health Standards – Underground Metal and Nonmetal Mines. https://www.msha.gov/volume-iv-metal-and-nonmetal-mines-table-contents.

APPENDIX A

Permit Application Form and Equipment List

SECTION 3.1

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Air Quality Division

1110 West Washington • Phoenix, AZ 85007 • Phone: (602) 771-2338

STANDARD CLASS II PERMIT APPLICATION FORM

(As required by A.R.S. § 49-426, and Chapter 2, Article 3, Arizona Administrative Code)

1. Permit to be issued to (Business license name of organization that is to receive permit):
   Energy Fuels Resources (USA) Inc.
2. Mailing Address: 225 Union Blvd. Suite 600
   City: Lakewood State: Colorado ZIP: 80228
3. Name (or names) of Responsible Official: Scott Bakken
   Phone: 303-389-4132 Fax: 303-389-4125 Email: sbakken@energyfuels.com
4. Facility Manager/Contact Person and Title: Steve Hancock; Director, Arizona Strip Operations
   Phone: 928-643-6185 ext. 206 Fax: Email: shancock@energyfuels.com
5. Facility Name: Pinyon Plain Mine
   Facility Location/Address (Current/Proposed): 6.5 miles southeast of Tusayan, AZ. T29N, R3E, Sec. 20
   City: Tusayan County: Coconino ZIP:
   Indian Reservation (if applicable, which one): N/A
   Latitude/Longitude, Elevation: 35.8828 deg N / 112.0961 deg W, 1981 m (6500 ft)
6. General Nature of Business: Underground Uranium Mine
7. Type of Organization:
   ☑ Corporation ☐ Individual Owner ☐ Partnership ☐ Government Entity ☐ LLC
   ☐ Other
8. Permit Application Basis: ☐ New Source ☐ Revision ☑ Renewal of Existing Permit
   For renewal or modification, include existing permit number (and exp. date): Date of Commencement of Construction or Modification: N/A
   62877 (as amended by 86356), expires 10-21-2021
   Primary Standard Industrial Classification Code: 1094
9. I certify that I have knowledge of the facts herein set forth, that the same are true, accurate and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by ADEQ as public record. I also attest that I am in compliance with the applicable requirements of the Permit and will continue to comply with such requirements and any future requirements that become effective during the life of the Permit. I will present a certification of compliance to ADEQ no less than annually and more frequently if specified by ADEQ. I further state that

I will assume responsibility for the construction, modification, or operation of the source in accordance with Arizona Administrative Code, Title 18, Chapter 2 and any permit issued thereof.

Signature of Responsible Official: _____

Printed Name of Signer/Official Title: Scott Bakken

Date: 4/12/21 Telephone Number: 303-389-4132

Section 3.5 - Equipment List

Type of Equipment	Maximum Rated Capacity	Make	Model	Serial Number	Date of Manufacture	Equipment ID Number
Emergency Generator	455 kW	Caterpillar	C15 ATAAC	N/A	2011	GEN455
Nonroad Generator	56 kW	Isuzu	DCA-70SSIU2	7351630	2009	GEN56
Evaporator Fan	N/A	Resource West	APEX 2.0	APX2-18-023	2019	APEX-023
Evaporator Fan	N/A	Resource West	APEX 2.0	APX2-18-024	2019	APEX-023
Evaporator Fan	N/A	Resource West	APEX 2.0	APX2-18-HHXL	2019	APEX-023
Evaporator Fan	N/A	Resource West	APEX 2.0	APX2-18-KZQH	2019	APEX-023

All relevant equipment utilized at the facility should be included in the equipment list. Please complete all fields.
The date of manufacture must be included in order to determine applicability of regulations.
Indicate the units (tons/hour, horsepower, etc.) when recording the maximum rated capacity.
Make additional copies of this form if necessary.

SECTION 3.6 - EMISSION SOURCE FORM

					USE THIS SECTION FOR MODIFICATIONS ONLY		
Emission Point		Regulated Air Pollutant Name	PTE		PTE AFTER MODIFICATION		CHANGE IN PTE
Number	Name		lbs/hr	tons/yr	lbs/hr	tons/yr	tons/yr
1	Emergency Generator	CO	3.50	0.17			
		NOx	3.50	0.17			
		$PM_{10}/PM_{2.5}$	0.10	0.005			
		VOC	0.40	0.02			
		SO_2	0.01	3.51E-4			
		CO_2e	N/A	37.25			
		HAPs	5.88E-3	2.94E-4			
2	Nonroad Generator	CO	0.61	2.68			
		NOx	0.55	2.39			
		$PM_{10}/PM_{2.5}$	0.05	0.22			
		VOC	0.03	0.15			
		SO_2	0.001	0.004			
		CO_2e	N/A	405.5			
		HAPs	7.24E-4	3.17E-3			

SECTION 3.6 - EMISSION SOURCE FORM (Page 2)

					USE THIS SECTION FOR MODIFICATIONS ONLY		
Emission Point		Regulated Air Pollutant Name	PTE		PTE AFTER MODIFICATION		CHANGE IN PTE
Number	Name		lbs/hr	tons/yr	lbs/hr	tons/yr	tons/yr
3	Propane Heaters	CO	0.005	0.02			
		NOx	0.009	0.04			
		PM_{10}/PM_{25}	0.0005	0.002			
		VOC	0.001	0.002			
		SO_2	1.31E-5	5.75E-5			
		CO2e	N/A	36.4			
4	Vent Shaft	$PM_{10}/PM_{2.5}$	0.36	1.56			
		Lead	4.63E-6	2.03E-5			
		HAPs	1.49E-3	6.51E-3			
5	Storage Piles	$PM_{2.5}$	0.01	0.03			
		PM_{10}	0.05	0.21			
		Lead	6.10E-7	2.03E-5			
		HAPs	1.05E-4	4.58E-4			

SECTION 3.6 - EMISSION SOURCE FORM (Page 2)

					USE THIS SECTION FOR MODIFICATIONS ONLY		
Emission Point		Regulated Air Pollutant Name	PTE		PTE AFTER MODIFICATION		CHANGE IN PTE
Number	Name		lbs/hr	tons/yr	lbs/hr	tons/yr	tons/yr
6	Material Handling	PM_{25}	0.01	0.06			
		PM_{10}	0.10	0.42			
		Lead	1.24E-6	5.41E-6			
		HAPs	6.27E-5	2.75E-4			
7	Road Fugitives	PM_{25}	0.03	0.12			
		PM_{10}	0.27	1.17			
8	Storage Tanks	VOC	0.0003	0.001			
		HAPs	3.06E-5	1.34E-4			
9	Evaporative Water System	$PM_{2.5}$	0.27	1.18			
		PM_{10}	0.35	1.55			

SECTION 5.0 -APPLICATION ADMINISTRATIVE COMPLETENESS CHECKLIST

	REQUIREMENT	MEETS REQUIREMENTS			COMMENT
		YES	NO	N/A	
1	Has the standard application form been completed?	X			
2	Has the responsible official signed the standard application form?	X			
3	Has a process description been provided?	X			
4	Are the facility's emissions documented with all appropriate supporting information?	X			
5	Is the facility subject to Minor NSR requirements? If the answer is "YES" , answer 6a, 6b and 6c as applicable. If the answer is "NO", skip to 7.		X		
6.a	If the facility chooses to implement RACT, is the RACT determination included for the affected pollutants for all affected emission units?				
6.b	If the facility chooses to demonstrate compliance with NAAQS by screen modeling, is the modeling analysis included?				
6.c	If refined modeling has been conducted, is a comprehensive modeling report along with all modeling files included?				
7	Does the application include an equipment list with the type, name, make, model, serial number, maximum rated capacity, and date of manufacture?	X			
8	Does the application include an identification and description of Pollution Controls? (if applicable)	X			
9	For any application component claimed as confidential, are the requirements of AR.S. 49-432 and A.A.C. R18-2-305 addressed?			X	
10	For any current non-compliance issue, is a compliance schedule attached?			X	
11	For minor permit revision that will make a modification upon submittal of application, has a suggested draft permit been attached?	X			

APPENDIX B

Emission Calculations

TABLE B-1
ENERGY FUELS RESOURCES (USA) INC. PINYON PLAIN MINE
FACILITY-WIDE ANNUAL EMISSIONS (TONS PER YEAR)

EMISSIONS	Generators	Propane Heaters	Vent Shaft	Storage Pile Fugitive Sources	Material Handling Sources	Road Fugitive Sources	Storage Tanks	Evaporative Water System	Total	PTE Increase	Permit Modification Exemption Threshold (AAC 18-2-101.101) (tpy)	Off-Site Road Fugitive Sources (tons/yr)
Criteria Pollutants												
CO	2.86	0.02	--	--	--	--	--	---	**2.88**	**2.7**	**50**	**--**
NOx	2.57	0.04	--	--	--	--	--	---	**2.61**	**2.4**	**20**	**--**
PM_{10}	0.223	0.002	1.56	0.21	0.42	1.17	--	1.55	**5.12**	**1.9**	**7.5**	29.40
$PM_{2.5}$	0.223	0.002	1.56	0.03	0.06	0.12	--	1.18	**3.18**	**1.4**	**5**	2.9
VOC	0.17	0.003	--	--	--	--	0.001	---	**0.17**	**0.1**	**20**	--
SO_2	4.18E-03	5.75E-05	--	--	--	--	--	---	**4.23E-03**	**3.81E-03**	**20**	**--**
Lead	--	---	2.03E-05	2.67E-06	5.41E-06	--	--	---	**2.83E-05**	**3.43E-07**	**0.3**	**--**
Non-Conventional Pollutants												
Sulfuric Acid Mist	---	---	---	---	---	---	0.000	---	**0.00**	**0**	**7**	
Greenhouse Gases												
CO_2e	442.7	36.4	--	--	--	--	--	---	**479.1**	**434.4**	**N/A**	

TABLE B-2
ENERGY FUELS RESOURCES (USA) INC. PINYON PLAIN MINE
FACILITY-WIDE SHORT TERM EMISSIONS (POUNDS PER HOUR)

EMISSIONS	Generators	Propane Heaters	Vent Shaft	Storage Pile Fugitive Sources	Material Handling Sources	Road Fugitive Sources	Storage Tanks	Evaporative Water System	Totals	Off-Site Road Fugitive Sources (lbs/hr)
Criteria Pollutants										
CO	4.11	0.005	---	---	---	---	---	---	**4.11**	**---**
NOx	4.04	0.009	---	---	---	---	---	---	**4.05**	**---**
PM_{10}	0.15	0.0005	0.36	0.05	0.10	0.27	---	0.35	**1.27**	6.7
$PM_{2.5}$	0.15	0.0005	0.36	0.01	0.01	0.03	---	0.27	**0.82**	0.7
VOC	0.43	0.001	---	---	---	---	0.0003	---	**0.43**	---
SO_2	7.9E-03	1.31E-05	---	---	---	---	---	---	**0.01**	---
Lead	---	---	4.63E-06	6.10E-07	1.24E-06	---	---	---	**6.47E-06**	---

'---' Emissions of compound are either not present or were not reported in the literature reviewed.

TABLE B-3
ENERGY FUELS RESOURCES (USA) INC. PINYON PLAIN MINE
FACILITY-WIDE ANNUAL HAZARDOUS AIR POLLUTANT EMISSIONS
(TONS PER YEAR)

EMISSIONS	Generators	Vent Shaft	Material Handling and Storage Piles	Storage Tank Emissions	Total Controlled Emissions
Naphthalene	7.75E-05	--	--	--	**7.75E-05**
Acetaldehyde	7.01E-04	--	--	--	**7.01E-04**
Acrolein	8.46E-05	--	--	--	**8.46E-05**
Benzene	8.53E-04	--	--	3.23E-05	**8.85E-04**
1,3-Butadiene	3.58E-05	--	--	--	**3.58E-05**
Ethyl benzene	--	--	--	4.02E-06	**4.02E-06**
Formaldehyde	1.08E-03	--	--	--	**1.08E-03**
Hexane	--	--	--	7.04E-05	**7.04E-05**
Toluene	3.74E-04	--	--	2.59E-05	**4.00E-04**
Xylenes	2.61E-04	--	--	1.63E-06	**2.62E-04**
Arsenic	--	7.17E-05	2.86E-05	--	**1.00E-04**
Lead	--	2.03E-05	8.08E-06	--	**2.83E-05**
Nickel	--	2.34E-05	9.32E-06	--	**3.27E-05**
Selenium	--	4.68E-06	1.86E-06	--	**6.54E-06**
Radionuclides	--	6.39E-03	6.85E-04	--	**7.08E-03**
Total HAPs	**3.47E-03**	**6.51E-03**	**7.33E-04**	**1.34E-04**	**1.08E-02**

TABLE B-4
ENERGY FUELS RESOURCES (USA) INC. PINYON PLAIN MINE
PILES AND PRODUCTION RATES[1]

Material Produced	Maximum Amount Produced Annually (tons/year)	Stockpile Name	Pile ID	Total Pile Volume (ft^3)	Pile Base Area (acres)	Pile Length (L) (ft)	Pile Width (W) (ft)	Pile Height (H) (ft)	Shape[3]	Exposed Surface Area (ft^2)
Ore	109,500	Ore Stockpile Area	OSA	610,000	0.70	250	122	20	Rectangular	45,400
Development Rock	54,750	Development Rock Stockpile	DRA	1,116,720	1.71	282	264	15	Rectangular	90,800
Topsoil[2]	0	Topsoil Stockpile	TS	108,000	0.26	225.00	50	10	Rectangular	16,500

1 Pile dimensions listed (width and length) are approximate, and are based on estimated pile heights and base areas given by the facility.
2 The amount of topsoil listed in the table is the amount produced over the lifetime of the mine, which is currently in place.
3 If the shape listed is a rectangualr, the surface area is calculated as the sum of the areas of the five exposed faces of the pile (LW + 2LH + 2WH).

TABLE B-5
ENERGY FUELS RESOURCES (USA) INC. PINYON PLAIN MINE
NEW GENERATOR EMISSIONS - CRITERIA POLLUTANTS

Explanation: The Pinyon Plain Mine receives its prime power from overhead electrical lines. One generator (455-kW) is used as a backup in the event of power outage or generator maintenance. A smaller generator (56-kW) is used for well monitoring and other miscellaneous uses. The calculations are based on specifications from the generator manufacturers and/or engine tier certified emission limits.

Emission Equations:

Hourly Emissions (lbs/hr) = PR (kW) * (1.341 hp/kW) * E (g/hp-hr) * (lb/453.56 g)
or
Hourly Emissions Per Unit (lbs/hr) = E (lbs/gal fuel) * F

24-Hour emissions (lb/hr) = Hourly Emissions (lbs/hr) * D/24hours

Annual emissions (tons/yr) = Hourly Emissions (lbs/hr) * OH * (ton/2000 lbs)

Where:
PR = generator power rating (kW)
E = emission factor
F = maximum fuel usage (gal/hr)
OH = annual operating hours (hours/year)
D = daily operating hours (hours/day)

Data:

PR (455 kW) =	455	kW	PR (56 kW) =	56	kW
OH (455 kW) =	100	hours/year	OH (56 kW) =	8760	hours/year
D (455 kW) =	12	hours/day	D (56 kW) =	12	hours/day

Generator Emissions Estimate

Generator Size	Pollutant	Emission Factor	Units	Emission Factor Source	Hourly Emissions[5] (lb/hr)	24-Hour Emissions[5] (lb/hr)	Annual Emissions (tons/yr)
Generator 1 (455-kW) [1]	CO	2.6	g/hp-hr	Caterpillar Emission Data[1]	3.50	NA	0.17
	NO_X	2.60	g/hp-hr	Caterpillar Emission Data[1]	3.50	NA	0.17
	$PM_{10}/PM_{2.5}$	0.075	g/hp-hr	Caterpillar Emission Data[1,2]	0.10	0.05	5.04E-03
	VOC	0.298	g/hp-hr	Caterpillar Emission Data[1,3]	0.40	NA	2.00E-02
	SO_2	2.13E-04	lbs SO_2/gal fuel	Calculation[4]	0.01	NA	3.51E-04
Generator 2 (new) (56-kW) [6]	CO	3.7	g/hp-hr	Tier 3 Standard	0.61	NA	2.68
	NO_X	3.30	g/hp-hr	Tier 3 Standard	0.55	NA	2.39
	$PM_{10}/PM_{2.5}$	0.300	g/hp-hr	Tier 3 Standard	0.05	0.02	0.22
	VOC	0.200	g/hp-hr	Tier 3 Standard	0.03	NA	0.15
	SO_2	2.13E-04	lbs SO_2/gal fuel	Calculation[4]	0.001	NA	0.004

[1] Engine is certified EPA Tier 4i. Emission factors presented represent 100% load values. According to Caterpillar, these values cannot be directly compared with EPA Tier 4i standards which are based on a weighted cycle.

[2] It was assumed in this analysis that 100% of the PM emission factor comes from PM_{10}.

[3] It was assumed in this analysis that 100% of the Total Unburned Hydrocarbon emission factor comes from VOCs.

[4] Emission factor based on: SO_2 (lbs/gal) = (0.0015 Wt% S in fuel) * (7.1 lb fuel/gal fuel) * (64 lb SO_2/32 lb S)

[5] 24-hour average $PM_{10}/PM_{2.5}$ emissions were calculated to correspond with the 24-hour average NAAQS.

TABLE B-6
ENERGY FUELS RESOURCES (USA) INC. PINYON PLAIN MINE
FRONT-END LOADER MATERIAL HANDLING EMISSIONS - CRITERIA POLLUTANTS

Emission Source: **FRONT-END LOADER - LOADING AND UNLOADING**
Pollutants: **PM_{10}, $PM_{2.5}$**

Emission Factor From: **AP-42, Section 13.2.4**
"Aggregate Handling and Storage Piles"

Emission Factor Rating: **A**

Explanation: A front-end loader is used to move ore from the ore storage bins into haul trucks or the ore stockpile area if the ore cannot be shipped immediately. Most of the ore will be shipped immediately.

Emission Equations: $$E = k*0.0032 *[((U/5)^{1.3})/((M/2)^{1.4})]$$

Where:
E = emission factor (lbs/ton)
k = Aerodynamic Particle Size Multiplier (unitless)
U = mean wind speed (mph)
M = material moisture content (%)

Data:

k_{PM10} =	0.35		[Areodynamic Particle Size Multiplier for particles < 10 µm (AP-42 13.2.4)]
$k_{PM2.5}$ =	0.053		[Areodynamic Particle Size Multiplier for particles < 2.5 µm (AP-42 13.2.4)]
U =	6.32	mph	[2006 mean wind speed from Grand Canyon National Park meteorological station]
M_{ore} =	5.4	%	[mean moisture content for lump ore from iron and steel production (AP-42, Table 13.2.4-1)]
$M_{waste\ rock}$ =	0.4	%	[mean moisture content for tailings from taconite mining and processing (AP-42, Table 13.2.4-1)]

E_{ore} =	**0.0003778**	**lbs/ton ore**
$E_{waste\ rock}$ =	**0.0144471**	**lbs/ton rock**
E_{ore} =	**0.0000572**	**lbs $PM_{2.5}$/ton ore**
E_{DR} =	**0.0021877**	**lbs $PM_{2.5}$/ton rock**

Annual PM_{10} emissions (tons/yr) = E * P * (ton/2000 lbs)
Short-term PM_{10} emissions (lbs/hr) = E * P / H

Where:
P = Annual production rate (tpy)
H = Working hours per year (hrs/yr)
= 8760 hours/year [assumes mine will be operational 365 days/year, 24 hours/day]

Material Handling	P (tpy)	H (hrs/yr)	PM_{10} Emissions (lbs/hr)	PM_{10} Emissions (tons/yr)	$PM_{2.5}$ Emissions (lbs/hr)	$PM_{2.5}$ Emissions (tons/yr)
Ore Unloading	109,500	8,760	0.0047	0.021	0.0007	0.003
Waste Rock Unloading	54,750	8,760	0.0903	0.395	0.0137	0.060
		Total Emissions	**0.10**	**0.42**	**0.01**	**0.06**

TABLE B-7
ENERGY FUELS RESOURCES (USA) INC. PINYON PLAIN MINE
STOCKPILE EMISSIONS - CRITERIA POLLUTANTS

Emission Source: **Wind Erosion of Stockpiles (Topsoil, Waste Rock, and Ore)**
Pollutants: **PM_{10}, $PM_{2.5}$**

Emission Factor From: **AP-42, Section 13.2.5; Industrial Wind Erosion**

Explanation: Particulate emissions from wind erosion of stockpiles are calculated as a function of mean wind speed, threshold velocity, the number of disturbances per year, the erosion potential, and particle size.
Misters will be used as needed to control emissions from the OSA. The topsoil pile will be seeded to mitigate fugitive dust.
Ore and waste rock aggregate size range is 1 to 6 inches.

Emission Equations:

$$E_{uc} = P * A * k * grams/year$$

$$P = 58(u'-u_t)^2 + 25(u'-u_t)$$

$$u' = 0.1*u10*(u_s/u_r)$$

$$u10 = u*(\ln(10/0.005)/\ln(h/0.005))$$

$$E_c = E_{uc} * (100-C)/100$$

Where:

E_{uc} = uncontrolled particle emissions (grams/year)
P = pile erosion potential (grams/m^2-disturbance)
A = pile surface area (m^2)
k = Aerodynamic Particle Size Multiplier (dimensionless)
N = number of pile disturbances in one year (disturbances/year)
u' = friction velocity (m/s)
u_t = threshold velocity (m/s) found in AP-42, Table 13.2.5-2
u10 = corrected fastest mile wind speed (m/s)
u_s/u_r = ratio of surface wind speed to approach wind speed (unitless)
u = fastest wind speed for the periods between disturbances (m/s)
h = anemometer height (m)
E_c = controlled particle emissions (grams/year)
C = control efficiency (%)

Data:

k_{PM10} =	0.5	unitless	[Aerodynamic Particle Size Multiplier for particles < 10 μm (AP-42 13.2.5)]
$k_{PM2.5}$ =	0.075	unitless	[Areodynamic Particle Size Multiplier for particles < 2.5 μm (AP-42 13.2.5)]
N =	1	disturbances/year	[assumed total surface area of the piles are disturbed once per year on average]
u_t =	1.33	m/s	[assumed threshold friction velocity for scoria, AP-42 13.2.5]
	1.02	m/s for top soil	[assumed threshold friction velocity for overburden, AP-4 13.2.5]
u_s/u_r =	0.9		[assumed maximum value, taken from AP-42, Section 13.2.5; maximum value will produce maximum emissions]
u =	46.0	miles per hour	[Fastest Mile for Flagstaff, AZ, measured May 1975, from Climate Data Summary]
h =	10	m	[assumed anemometer height for Flagstaff, AZ]
C =	90	%	[assumed control efficiency for seeding topsoil piles]

PM Emissions:

Stockpile	Pile Volume (cubic ft.)	Annual Disturbed Area (sq.ft.)	Uncontrolled PM_{10} Emissions		Controlled PM_{10} Emissions		Controlled $PM_{2.5}$ Emissions	
			(tons/yr)	(lb/hr)	(tons/yr)	(lb/hr)	(tons/yr)	(lb/hr)
OSA	610,000	45,400	0.067	0.015	0.067	0.015	0.010	0.002
DRA	1,116,720	90,800	0.134	0.030	0.134	0.030	0.020	0.005
TS	108,000	16,500	0.051	0.012	0.005	0.001	0.001	0.007
Total Pile Emissions			**0.252**	**0.057**	**0.205**	**0.047**	**0.030**	**0.007**

Note: It was assumed the entire surface area of a pile will be available for disturbance at any given time.

TABLE B-8
ENERGY FUELS RESOURCES (USA) INC. PINYON PLAIN MINE
FUGITIVE UNPAVED ROAD EMISSIONS - CRITERIA POLLUTANTS

Emission Source: **FUGITIVE DUST EMISSIONS FROM VEHICLE TRAFFIC**

Pollutants: **PM_{10}, $PM_{2.5}$**

Emission Factor Reference: **AP-42, Section 13.2.2**
"Unpaved Roads"

Emission Factor Rating: **B**

Explanation:

PM emissions for on- and off-site vehicle traffic are calculated by using the predictive emission factor equation for unpaved roads in AP-42, Section 13.2.2. Emissions are calculated by first calculating an emission factor for each vehicle type, which is then multiplied by the calculated vehicle miles traveled (VMT) for each vehicle. To calculate VMT, an examination of the on-site roads is necessary. All roads within the facility boundary are unpaved. The main site access is an unpaved road entering on the east side of the site. The vast majority of truck (i.e. haul trucks, pick-up trucks, tanker trucks, and water trucks) travel occurs on the southern portion of the site. Nonroad vehicles, such as front-end loaders, travel only on site in the portal area. In most cases, the VMT is calculated by taking the frequency of use and multiplying by the quantity of the amount of material hauled divided by the capacity of the vehicle. The product is then multiplied by the haul road distance times two, to accommodate round-trips. When the VMT is not dependant on the amount of material being hauled (such as a pickup truck), the annual VMT is determined by multiplying the distance traveled per trip by an average number of trips per year.

Dust suppression methods including watering as needed and limiting travel speeds will be applied to all traveled on-site roadways and the immediately adjacent access road. Dust suppression methods of limiting travel speeds will be applied to off-site haul roads.

Emission Equations:

$$E_{uc} = k * (s/12)^{a} * (W/3)^{b}$$

$$E_{c} = E_{uc} * [(100 - C) / 100]$$

Where:
E_{uc} = uncontrolled emission factor (lbs/VMT)
E_{c} = controlled emission factor (lbs/VMT)
k = Aerodynamic Particle Size Multiplier (unitless)
s = surface material silt content (%)
a = particle size multiplier constant (unitless)
W = mean vehicle weight (tons)
b = particle size multiplier constant (unitless)
C = control efficiency of surfactant used to mitigate fugitive dust emissions from roads (%)

Hourly Uncontrolled PM_{10} emissions (lbs/hr) = E_{uc} * (hourly VMT)
Annual Uncontrolled PM_{10} emissions (tons/yr) = E_{uc} * (Annual VMT) * (ton/2000 lbs)
Hourly Controlled PM_{10} emissions (lbs/hr) = E_{c} * (hourly VMT)
Annual Controlled PM_{10} emissions (tons/yr) = E_{c} * (Annual VMT) * (ton/2000 lbs)

Constants:

k_{PM10} =	1.5		[AP-42 13.2.2, Table 2]
$k_{PM2.5}$ =	0.15		[AP-42 13.2.2, Table 2]
s =	5.8	%	[average silt content for a haul road (to/from pit) at a taconite ore mining and processing facility (AP-42, 13.2.2)]
$a_{PM10,PM2.5}$ =	0.9		[AP-42 13.2.2, Table 2]
$b_{PM10,PM2.5}$ =	0.45		[AP-42 13.2.2, Table 2]
C_{OSR} =	74.8	**%**	[Onsite roads: emission control for low travel speeds and watering (44% + 55%); WRAP Fugitive Dust Handbook]
C_{HR} =	44.0	**%**	[Haul roads: emission control for low travel speeds; WRAP Fugitive Dust Handbook]

L_{hr} = Amount of material hauled per hour (tph)
L_{yr} = Amount of material hauled per year (tpy)
Annual VMT = L_{yr} / Truck Capacity * D_{rt}
D_{rt} = Round-Trip Hauling Distance (miles)

TABLE B-8 (cont.)
ENERGY FUELS (USA) INC. - PINYON PLAIN MINE
FUGITIVE UNPAVED ROAD EMISSIONS - CRITERIA POLLUTANTS

Calculations for onsite roads:

Vehicle Type	Load Type	W (tons)	E_{uc} (lbs/VMT)	E_c (lbs/VMT)	L_{yr} (tons/year or gallons/year)[1]	L_{hr} (tons per hour or gallons/hour)[1]	Vehicle Capacity (tons/vehicle)	D_{rt}[2] (miles)	Annual VMT (VMT/yr)	Uncontrolled PM_{10} Emissions		Controlled PM_{10} Emissions		Controlled $PM_{2.5}$ Emissions	
										Annual (tpy)	Hourly (lbs/hr)	Annual (tpy)	Hourly (lbs/hr)	Annual (tpy)	Hourly (lbs/hr)
Haul Truck	Ore	28	2.113	0.53	109,500	13	25	0.37	1627	1.72	0.39	0.43	0.099	0.04	0.01
Front-End Loader	Ore	7	1.1	0.29	109,500	13	4	0.06	1653	0.94	0.22	0.24	0.054	0.02	0.005
	Waste Rock	7	1.1	0.29	54,750	6	4	0.20	2746	1.57	0.36	0.40	0.090	0.04	0.01
Pick-Up Truck	Various	3	0.78	0.20	N/A	N/A	N/A	0.39	286	0.11	0.03	0.03	0.006	0.003	0.001
Water Truck	Dust Suppressant	19	1.8	0.45	N/A	N/A	8	0.88	319	0.29	0.07	0.07	0.017	0.01	0.002
Tanker Truck	Fuel	24	2.0	0.50	40,000	N/A	18	0.50	3	0.003	0.001	0.0008	0.0002	0.00008	0.00002
									TOTAL EMISSIONS FOR ALL ONSITE ROAD TRAFFIC	**4.64**	**1.06**	**1.17**	**0.27**	**0.12**	**0.03**

N/A = not applicable

1 The Tanker Truck Vehicle Capacity is in units of gallons/year

2 On-Site Round-Trip Hauling Distance is estimated for each vehicle type, based on the following routes:

Haul Truck 2*(Road A + Road B + Road C + Road O + Road M + Road N)
Front-End Loader (Ore) 2*(Road O)
Front-End Loader (Waste) 2*(Road K + Road M + Road P)
Pick-Up Truck 2* (Road A + Road B + Road C) + Road D + Road E + Road L + Road M + Road N
Water Truck 2* (Road A + Road B + Road C + Road F + Road I + Road L + Road M + Road O + Road P) + Road D + Road E + Road G + Road H + Road J + Road K + Road N
Tanker Truck 2*(Road A + Road B + Road C + Road G + Road L + Road M + Road N)

Calculations for off-site haul roads:

Vehicle Type	Load Type	W (tons)	E_{uc} (lbs/VMT)	E_c (lbs/VMT)	L_{yr} (tons/year or gallons/year)[1]	L_{hr} (tons per hour or gallons/hour)[1]	Vehicle Capacity (tons/vehicle)	D_{rt}[2] (miles)	Annual VMT (VMT/yr)	Uncontrolled PM_{10} Emissions		Controlled PM_{10} Emissions		Controlled $PM_{2.5}$ Emissions	
										Annual (tpy)	Hourly (lbs/hr)	Annual (tpy)	Hourly (lbs/hr)	Annual (tpy)	Hourly (lbs/hr)
Haul Truck	Ore	28	2.113	1.18	109,500	13	25	10.00	43822	46.30	10.57	25.93	5.919	2.59	0.59
Front-End Loader	Ore	7	1.1	0.64	109,500	13	4	0.00	0	0.00	0.00	0.00	0.000	0.00	0.00
	Waste Rock	7	1.1	0.64	54,750	6	4	0.00	0	0.00	0.00	0.00	0.000	0.00	0.00
Pick-Up Truck	Various	3	0.78	0.44	N/A	N/A	N/A	10.00	7304	2.85	0.65	1.59	0.364	0.16	0.036
Water Truck	Dust Suppressant	19	1.8	1.01	N/A	N/A	8	10.00	3652	3.28	0.75	1.84	0.419	0.18	0.042
Tanker Truck	Fuel	24	2.0	1.11	40,000	N/A	18	10.00	67	0.07	0.02	0.04	0.008	0.0037	0.0008
									TOTAL EMISSIONS FOR ALL HAUL ROAD TRAFFIC	**52.49**	**11.98**	**29.40**	**6.71**	**2.94**	**0.67**

N/A = not applicable

1 The Tanker Truck Vehicle Capacity is in units of gallons/year

2 On-Site Round-Trip Hauling Distance is estimated for each vehicle type, based on the following routes:

Haul Truck 2*Haul Road
Front-End Loader (Ore)
Front-End Loader (Waste)
Pick-Up Truck 2*Haul Road
Water Truck 2*Haul Road
Tanker Truck 2*Haul Road

TABLE B-9
ENERGY FUELS RESOURCES (USA) INC. PINYON PLAIN MINE
FUGITIVE UNPAVED ROAD EMISSIONS - MODELING PARAMETERS

Emission Source: **FUGITIVE DUST EMISSIONS FROM VEHICLE TRAFFIC**
Pollutants: **PM_{10}**

Modeling Parameter Estimate From: **ADEQ Air Dispersion Modeling Guidelines for Arizona Air Quality Permits**
Road Emission Source Modeling Technique

Explanation: To represent road emissions as volume sources, the following eight steps were followed:

1. Determine the adjusted width of the road. The adjusted width is the actual width of the road plus 6 meters. The additional width represents turbulence caused by the vehicle as it moves along the road. This width will represent a side of the base of the volume.
2. Determine the number of volume sources, N. Divide the length of the road by the adjusted width. The result is the maximum number of volume sources that could be used to represent the road.
3. Determine the height of the volume. The height will be equal to twice the height of the vehicle generating the emissions – rounded to the nearest meter.
4. Determine the initial horizontal sigma for each volume.

a. If the road is represented by a single volume, divide the adjusted width by 4.3.
b. If the road is represented by adjacent volumes, divide the adjusted width by 2.15.
c. If the road is represented by alternating volumes, divide by twice the adjusted width (measured from the center point of the first volume to the center point of the next represented volume) by 2.15. Start with the volume nearest to the property line. This representation is often used for long roads.

5. Determine the initial vertical sigma. Divide the height of the volume determined in Step 3 by 2.15.
6. Determine the release point. Divide the height of the volume by two. This point is the center of the volume.
7. Determine the emission rate for each volume used to calculate the initial horizontal sigma in Step 4. Divide the total emission rate equally among the individual volumes used to represent the road, unless there is a known spatial variation in emissions.
8. Determine the UTM coordinate for the release point. The release point location is in the center of the base of the volume. This location must be at least one meter from the nearest receptor.

Road ID	Road Length (m)	Road Thickness (ft)	Road Thickness (m)	Road Adjusted Width (m)	Max Number of volume sources - N	Number of volume sources modeled[a]	Volume source spacing (m)	source height[b] (m)	sigma (y0)	sigma (z0)	Release Height (m)
Haul	8049.00	32.00	9.75	15.75	511	256	31.5	9	14.7	4.25	4.57
A	50.08	24.00	7.32	13.32	4	4	12.5	9	6.19	4.25	4.57
B	56.23	24.00	7.32	13.32	4	4	14.1	9	6.19	4.25	4.57
C	57.09	24.00	7.32	13.32	4	4	14.3	9	6.19	4.25	4.57
D	113.54	30.00	9.14	15.14	7	7	16.2	9	7.04	4.25	4.57
E	46.02	30.00	9.14	15.14	3	3	15.3	9	7.04	4.25	4.57
F	21.36	30.00	9.14	15.14	1	1	21.4	9	3.52	4.25	4.57
G	95.88	24.00	7.32	13.32	7	7	13.7	9	6.19	4.25	4.57
H	152.74	24.00	7.32	13.32	11	11	13.9	9	6.19	4.25	4.57
I	22.23	30.00	9.14	15.14	1	1	22.2	9	3.52	4.25	4.57
J	52.70	30.00	9.14	15.14	3	3	17.6	9	7.04	4.25	4.57
K	49.50	30.00	9.14	15.14	3	3	16.5	9	7.04	4.25	4.57
L	58.26	24.00	7.32	13.32	4	4	14.6	9	6.19	4.25	4.57
M	44.99	24.00	7.32	13.32	3	3	15.0	9	6.19	4.25	4.57
N	41.35	30.00	9.14	15.14	3	3	13.8	9	7.04	4.25	4.57
O	49.17	24.00	7.32	13.32	4	4	12.3	9	6.19	4.25	4.57
P	68.93	24.00	7.32	13.32	5	5	13.8	9	6.19	4.25	4.57

(a) The number of volume sources was adjusted in some cases according to site layout restrictions.
(b) Truck height assumed to be 15 ft.

TABLE B-10
ENERGY FUELS RESOURCES (USA) INC. PINYON PLAIN MINE
FUGITIVE FUEL STORAGE TANK EMISSIONS - CRITERIA POLLUTANTS

Emission Source: **Fugitive Emissions from Fuel Storage Tanks**
Pollutants: **VOCs**

Emission Estimate From: **EPA TANKS 4.0.9D Storage Tank Emissions Calculation Software**

Explanation: Both diesel storage tanks are considered insignificant activities per AAC 18-2-101.68. VOC emissions for these tanks were calculated using EPA's TANKS 4.0.9D Windows-based computer software program that estimates VOC and hazardous air pollutant (HAP) emissions from fixed- and floating-roof storage tanks. Although EPA has stopped supporting this software, it remains useful for calculating emissions from simple fixed-roof storage tanks such as those at the Pinyon Plain Mine. Storage tank specifications provided by Energy Fuels were used as input into the EPA TANKS model.

Annual VOC Emissions:

Storage Tank	Contents	Tank Volume (gallons)	Tank Orientation	Tank Length (ft)	Tank Width (ft)	Tank Height (ft)	Diameter (ft)	Average Liquid Height (ft)	Turnovers per Year per Tank	Annual VOC Emissions		
										(lbs/year)	(tons/year)	(lbs/hr)
AST #1	Diesel	6,000	V	N/A	N/A	16.00	8.0	8.0	6.7	2.440	1.22E-03	2.79E-04
Portable Tote	Diesel	150	V	4.0	2.3	2.30	N/A	1.2	52.0	0.07	3.50E-05	7.99E-06
Total										2.510	1.26E-03	2.87E-04

TABLE B-11
ENERGY FUELS RESOURCES (USA) INC. PINYON PLAIN MINE
VENT SHAFT EMISSIONS - CRITERIA POLLUTANTS

Emission Source: **VENT SHAFT**
Pollutants: **PM_{10}, $PM_{2.5}$**

Emission Factor From: **MSHA**

Explanation: A vent shaft is used at the Pinyon Plain Mine for mine aeration and air circulation. The vent shaft may have particulate emissions due to underground activities. A total particulate emission value is calculated by multiplying the ventilation rate from the vent opening by an emission factor for particulate emissions. Watering in the mine will be implemented to reduce particulate emissions.

Emission Equations: **Hourly Emissions (lbs/hr) = VR * E * (%UC/100) * $(0.3048 m/ft)^3$ * (g/1000 mg) * (lb/453.56 g) * (60 min/hr)**

Annual Emissions (tons/yr) = Hourly Emissions (lbs/hr) * OH * (ton/2000 lbs)

Where:
VR = ventilation rate (actual ft^3/min)
E = particulate emission factor (mg/m^3)
%UC = percentage of time in up cast mode (%)
OH = annual operating hours (hrs/yr)
C = control efficiency (%)

Data:
OH = 8760 hrs/yr
E = 1 mg/m^3 $PM_{10}/PM_{2.5}$
C = 62 % (assumed for material handling water application, based on Table 4-2 of the Western Regional Air Partnership (WRAP) Fugitive Dust Handbook)

Vent Shaft Emissions Estimate:

Mine	Vent Hole ID	VR	Fan Type	%UC[1]	Hourly Uncontrolled $PM_{10}/PM_{2.5}$ Emissions per Vent[2]	Annual Uncontrolled $PM_{10}/PM_{2.5}$ Emissions per Vent[2]	Hourly Controlled $PM_{10}/PM_{2.5}$ Emissions per Vent[2]	Annual Controlled $PM_{10}/PM_{2.5}$ Emissions per Vent[2]
	--	(ft^3/min)	--	(%)	(lbs/hr)	(tons/yr)	(lbs/hr)	(tons/yr)
Pinyon Plain	CanVent	250,000	Up Cast	100%	0.94	4.10	0.36	1.56
Total Pinyon Plain Mine Vent Hole Emissions					*0.94*	*4.10*	*0.36*	*1.56*

1 Fans in the down cast mode predominantly pull air from ambient air into the vent shaft; no particulates will be released to ambient air during down cast operation.
2 It was assumed in this analysis that 100% of the PM_{10} is $PM_{2.5}$.

TABLE B-12
ENERGY FUELS RESOURCES (USA) INC. PINYON PLAIN MINE
CURRENT GENERATOR EMISSIONS - HAZARDOUS AIR POLLUTANTS

Explanation: The Pinyon Plain Mine receives its prime power from overhead electrical lines. One generator (455-kW) is used as a backup in the event of power outage or generator maintenance. A smaller generator (56-kW) is used for well monitoring and other miscellaneous uses. The calculations are based on specifications from the generator manufacturers and/or engine tier certified emission limits.

Emission Equations: **Hourly (lbs/hr) = PR * (1.341 hp/kW)*(2544 BTU/hr/hp)*(mmBTU/10^6 BTU)*E (lb/mmBTU)**
Annual (tons/yr) = Hourly Emissions (lbs/hr) * OH * (ton/2000 lbs)

Total Emissions = Emissions per Unit * Number of Units

Where:
PR = generator power rating (kW)
E = emission factor (lb/mmBTU)
OH = annual operating hours (hours/year)

Data:
PR (455 kW) = 455 kW
OH (455 kW) = 100 hours/yr
PR (56 kW) = 56 kW
OH (56 kW) = 8760 hours/yr

Generator Emissions Estimate

Pollutant	Emission Factor	Units	Source	455 kW Generator			56 kW Generator			Total Generators			Chemical Abstract Services (CAS) Number
				Hourly Emissions (lb/hr)	Annual Emissions (lb/yr)	Annual Emissions (ton/yr)	Hourly Emissions (lb/hr)	Annual Emissions (lb/yr)	Annual Emissions (ton/yr)	Hourly Emissions (lb/hr)	Annual Emissions (lb/yr)	Annual Emissions (ton/yr)	
Naphthalene	8.48E-05	lb/mmBtu	AP-42 (10/96) Table 3.3-2	1.32E-04	1.32E-02	6.58E-06	1.62E-05	1.42E-01	7.10E-05	1.48E-04	1.55E-01	7.75E-05	91-20-3
Acetaldehyde	7.67E-04	lb/mmBtu	AP-42 (10/96) Table 3.3-2	1.19E-03	1.19E-01	5.95E-05	1.47E-04	1.28E+00	6.42E-04	1.34E-03	1.40E+00	7.01E-04	75-07-0
Acrolein	9.25E-05	lb/mmBtu	AP-42 (10/96) Table 3.3-2	1.44E-04	1.44E-02	7.18E-06	1.77E-05	1.55E-01	7.74E-05	1.61E-04	1.69E-01	8.46E-05	107-02-8
Benzene	9.33E-04	lb/mmBtu	AP-42 (10/96) Table 3.3-2	1.45E-03	1.45E-01	7.24E-05	1.78E-04	1.56E+00	7.81E-04	1.63E-03	1.71E+00	8.53E-04	71-43-2
1,3-Butadiene	3.91E-05	lb/mmBtu	AP-42 (10/96) Table 3.3-2	6.07E-05	6.07E-03	3.03E-06	7.47E-06	6.54E-02	3.27E-05	6.82E-05	7.15E-02	3.58E-05	106-99-0
Formaldehyde	1.18E-03	lb/mmBtu	AP-42 (10/96) Table 3.3-2	1.83E-03	1.83E-01	9.16E-05	2.25E-04	1.97E+00	9.87E-04	2.06E-03	2.16E+00	1.08E-03	50-00-0
Toluene	4.09E-04	lb/mmBtu	AP-42 (10/96) Table 3.3-2	6.35E-04	6.35E-02	3.17E-05	7.81E-05	6.84E-01	3.42E-04	7.13E-04	7.48E-01	3.74E-04	108-88-3
Xylenes	2.85E-04	lb/mmBtu	AP-42 (10/96) Table 3.3-2	4.42E-04	4.42E-02	2.21E-05	5.44E-05	4.77E-01	2.38E-04	4.97E-04	5.21E-01	2.61E-04	1330-20-7
Total HAPs	**3.79E-03**	**lb/mmBtu**	**AP-42 (10/96) Table 3.3-2**	**5.88E-03**	**5.88E-01**	**2.94E-04**	**7.24E-04**	**6.34E+00**	**3.17E-03**	**6.61E-03**	**6.93E+00**	**3.47E-03**	--

Note:
No Inorganic HAPs emission factors provided in AP-42, Section 3.3

Max Power Rating	455	kw	56	kw	
Max Power Rating	610	hp	75	hp	1.341 hp/kw
Heat input	1.55	MMbtu/hr	0.19	MMbtu/hr	1hp = 2544 Btu/hr
Maximum Annual Hours o	100	hours/year	8760	hours/year	

TABLE B-13
ENERGY FUELS RESOURCES (USA) INC. PINYON PLAIN MINE
ORE AND WASTE ROCK EMISSIONS - HAZARDOUS AIR POLLUTANTS

Controlled Emissions

Waste Rock Composition[1] Ore Sampling Composition[2]	PM_{10}		Arsenic 46.0 ppm		Lead 13.0 ppm		Nickel 15 ppm		Selenium 3.0 ppm		Uranium 300 ppm 6000 ppm		Total HAPs	
Emissions Source Description[3]	**lb/ hour**	**lb/ year**	**lb/ hour**	**lb/ year**	**lb/ hour**	**lb/ year**	**lb/ hour**	**lb/ year**	**lb/ hour**	**lb/ year**	**lb/ hour**	**lb/ year**	**lb/ hour**	**lb/ year**
Vent Shaft	0.36	3,117.4	1.6E-05	1.4E-01	4.6E-06	4.1E-02	5.3E-06	4.7E-02	1.1E-06	9.4E-03	1.5E-03	1.3E+01	1.49E-03	13.027
Front-End Ore Loading and Unloading	0.005	41.4	2.2E-07	1.9E-03	6.1E-08	5.4E-04	7.1E-08	6.2E-04	1.4E-08	1.2E-04	2.8E-05	2.5E-01	2.87E-05	0.251
Front-End Waste Rock Loading and Unloading	0.09	791.0	4.2E-06	3.6E-02	1.2E-06	1.0E-02	1.4E-06	1.2E-02	2.7E-07	2.4E-03	2.7E-05	2.4E-01	3.40E-05	0.298
Ore Storage Piles	0.02	133.5	7.0E-07	6.1E-03	2.0E-07	1.7E-03	2.3E-07	2.0E-03	4.6E-08	4.0E-04	9.1E-05	8.0E-01	9.26E-05	0.811
Waste Rock Storage Piles	0.03	267.0	1.4E-06	1.2E-02	4.0E-07	3.5E-03	4.6E-07	4.0E-03	9.1E-08	8.0E-04	9.1E-06	8.0E-02	1.15E-05	0.101
Top Soil Storage Piles	0.001	10.3	5.4E-08	4.7E-04	1.5E-08	1.3E-04	1.8E-08	1.5E-04	3.5E-09	3.1E-05	3.5E-07	3.1E-03	4.42E-07	0.004
Total Rock HAP Emissions	**0.50**	**4,360.5**	**2.3E-05**	**0.20**	**6.5E-06**	**0.06**	**7.5E-06**	**0.07**	**1.5E-06**	**0.01**	**0.0016**	**14.16**	**1.7E-03**	**14.49**

1 Chemical composition of HAPs in waste rock is from 11 waste rock samples from the Arizona strip.

2 Uranium composition in ore is based on uranium ore sample data for Arizona strip mines. It has been assumed that composition of other metals in ore is similar to the composition in waste rock.

3 It was conservatively assumed for the purposes of these calculations that top soil storage piles have the same mineral composition as waste rock. It was also assumed that HAP emissions for other operations are based on percentage of ore and waste rock associated with these operations. For the vent shaft, it was conservatively assumed that 67% of the PM makeup was ore and 33% was waste rock, which is the same as the expected percentages of rock mined.

TABLE B-14
ENERGY FUELS RESOURCES (USA) INC. PINYON PLAIN MINE
DIESEL TANK EMISSIONS - TOXIC POLLUTANTS

Pollutant	Emission Factor	Units	Source	Hourly Emissions (lb/hr)	Annual Emissions (ton/yr)	Chemical Abstract Services (CAS) Number
Benzene	2.57	Percent of VOC Vapor	SPECIATE 3.2 Profile	7.36E-06	3.23E-05	71-43-2
Ethyl benzene	0.32	Percent of VOC Vapor	SPECIATE 3.2 Profile	9.17E-07	4.02E-06	100-41-4
Hexane	5.61	Percent of VOC Vapor	SPECIATE 3.2 Profile	1.61E-05	7.04E-05	110-54-3
Toluene	2.06	Percent of VOC Vapor	SPECIATE 3.2 Profile	5.90E-06	2.59E-05	108-88-3
Xylenes	0.13	Percent of VOC Vapor	SPECIATE 3.2 Profile	3.72E-07	1.63E-06	1330-20-7
Total Organic HAPs	**10.69**	**Percent of VOC Vapor**	**SPECIATE 3.2 Profile**	**3.06E-05**	**1.34E-04**	-

Note:
Emission estimates based on emission factors provided in the US EPA SPECIATE 3.2 database for "Composite of 9 Emission Profiles from Distillate Oil Storage Tanks - 1993" (Profile 2488).

TABLE B-15
ENERGY FUELS RESOURCES (USA) INC. - PINYON PLAIN MINE
FUEL BURNING EQUIPMENT - GREENHOUSE GAS POLLUTANTS

Emission Source: **GENERATORS; 40 CFR Part 98, Table C-1**
Calculation Notes: Calculations are based on specifications from the equipment manufacturers and the EPA GHG Reporting Rule.

Emission Equations: **Annual emissions (metric tons/yr) = 1 x 10^{-3} * Fuel * HHV * EF**
Total Emissions = Emissions per Unit * Number of Units

Where:
1 x 10^{-3} = Conversion from kg to metric tons
Fuel = Mass or volume of fuel combusted per year
HHV = Default high heat value of fuel
EF = Fuel emission factor

Data:	HHV (#2 Fuel Oil) =	0.138	mmBTU/gallon	HHV (Propane) =	0.091	mmBTU/gallon
	CO_2 EF =	73.96	kg/mmBTU	CO_2 EF =	62.87	kg/mmBTU
	CH_4 EF =	3.00E-03	kg/mmBTU	CH_4 EF =	3.00E-03	kg/mmBTU
	N_2O EF =	6.00E-04	kg/mmBTU	N_2O EF =	6.00E-04	kg/mmBTU
Power Rating (PR):	PR (455) =	455	kW	PR (56) =	56	kW
Fuel Usage (F):	F (455) =	33	gal/hr	F (56) =	4.1	gal/hr
Operation hours (OH):	OH (455) =	100	hrs/yr	OH (56) =	8760	hrs/yr

Propane Heaters Fuel Usage (F):	5746.56	gal/yr
Propane Heaters Operation Hours (OH):	8760	hrs/yr

Global Warming Potential (GWP)

CO_2 =	1
CH_4 =	21
N_2O =	310

Emissions Estimate:

Generator	Generator Rating (kW)	Pollutant	Emission Factor per Unit	Units	Emission Factor Source	Annual Emissions (kg/yr)	Annual Emissions (metric tons/yr)	Annual Emissions (short tons/yr)
CAT 455	455	CO_2	73.96	kg/mmBTU	40 CFR Part 98, Table C-1	33,681	33.7	37.1
		CH_4	3.00E-03	kg/mmBTU	40 CFR Part 98, Table C-2	1.4	1.37E-03	1.51E-03
		N_2O	6.00E-04	kg/mmBTU	40 CFR Part 98, Table C-2	0.3	2.73E-04	3.01E-04
Isuzu 56	56	CO_2	73.96	kg/mmBTU	40 CFR Part 98, Table C-1	366,576	366.6	404.1
		CH_4	3.00E-03	kg/mmBTU	40 CFR Part 98, Table C-2	14.9	1.49E-02	1.64E-02
		N_2O	6.00E-04	kg/mmBTU	40 CFR Part 98, Table C-2	2.97	2.97E-03	3.28E-03
					CO_2e	**401,605**	**401.6**	**442.7**

Heater	Rating (Btu/hr)	Pollutant	Emission Factor per Unit	Units	Emission Factor Source	Annual Emissions (kg/yr)	Annual Emissions (metric tons/yr)	Annual Emissions (short tons/yr)
Propane Heaters	60000	CO_2	62.87	kg/mmBTU	40 CFR Part 98, Table C-1	32,877	32.9	36.2
		CH_4	3.00E-03	kg/mmBTU	40 CFR Part 98, Table C-2	1.6	1.57E-03	1.73E-03
		N_2O	6.00E-04	kg/mmBTU	40 CFR Part 98, Table C-2	0.31	3.14E-04	3.46E-04
					CO_2e	**33,007**	**33.0**	**36.4**

TABLE B-16
ENERGY FUELS RESOURCES (USA) INC. - PINYON PLAIN MINE
EVAPORATIVE WATER SYSTEM EMISSION CALCULATIONS USING GRIFFITH ENERGY EMISSION FACTORS

Project	Year	Type of Unit	Rated Capacity (gpm)	psi	Operating Hours	PM_{10} (lbs/kgal)	PM_{10} (tons/yr)	$PM_{2.5}$ (lbs/kgal)	$PM_{2.5}$ (tons/yr)
Emission Factors from Griffith Energy Study[1]									
Griffith Energy	2015	Turbo-Mister	80.1	150	8760	0.022	0.47	0.0168	0.35
EWS with four APEX 2.0 units									
Emission Estimates (using Griffith Energy EFs)									
Canyon (potential)	2019	APEX 2.0 S.N. APX2-18-023	67	100	8760	0.022	0.39	0.0168	0.30
Canyon (potential)	2019	APEX 2.0 S.N. APX2-18-024	67	100	8760	0.022	0.39	0.0168	0.30
Canyon (potential)	2019	APEX 2.0 S.N. APX2-19-HHXL	67	100	8760	0.022	0.39	0.0168	0.30
Canyon (potential)	2020	APEX 2.0 S.N. APX2-19-KZQH	67	100	8760	0.022	0.39	0.0168	0.30
						Totals:	**1.55**		**1.18**

TABLE B-17
ENERGY FUELS RESOURCES (USA) INC. PINYON PLAIN MINE
FUGITIVE SULFURIC ACID STORAGE TANK EMISSIONS - NON-CONVENTIONAL POLLUTANTS

Emission Source: **Fugitive Emissions from Sulfuric Acid Storage Tank**
Pollutants: **H2SO4**

Emission Estimate From: **EPA TANKS 4.0.9D Storage Tank Emissions Calculation Software**

Explanation: H2SO4 emissions for this tank was calculated using EPA's TANKS 4.0.9D Windows-based computer software program that estimates emissions from fixed- and floating-roof storage tanks. Although EPA has stopped supporting this software, it remains useful for calculating emissions from simple fixed-roof storage tanks such as those at the Pinyon Plain Mine. Storage tank specifications provided by Energy Fuels were used as input into the EPA TANKS model.

Annual H2SO4 Emissions:

Storage Tank	Contents	Tank Volume (gallons)	Tank Orientation	Tank Length (ft)	Tank Width (ft)	Tank Height (ft)	Diameter (ft)	Average Liquid Height (ft)	Turnovers per Year per Tank	Annual VOC Emissions		
										(lbs/year)	(tons/year)	(lbs/hr)
H2SO4 Tote	H2SO4	275	H	4.0	3.50	3.00	N/A	1.5	12.0	0.0	0.0	0.0
Total										0.0	0.0	0.0

TABLE B-18
ENERGY FUELS RESOURCES (USA) INC. PINYON PLAIN MINE
PROPANE HEATERS

Explanation: Propane Heaters (60,000 btu total)
Estimated Usage is 20,000 btu/hr (~5 gal/day)
Maximum Usage: 60,000 btu/hr (~15.7 gal/day)

Compressor Emissions Calculations

Source	Rating (Btu/hr)	Hourly Fuel Usage gal/hr	Annual Fuel Usage gal/yr*	Pollutant	Emission Factor	Units	Emission Factor Source	Hourly Emissions (lbs/hr)	Annual Emissions (tpy)
Propane Heaters	60,000	0.656	5746.56	CO	7.50	lb/10^3 gal	AP-42, Section 1.5	0.005	0.022
				NO_X	13.00	lb/10^3 gal	AP-42, Section 1.5	0.009	0.037
				$PM_{10}/PM_{2.5}$	0.70	lb/10^3 gal	AP-42, Section 1.5	0.0005	0.0020
				VOC	1.00	lb/10^3 gal	AP-42, Section 1.5	0.001	0.003
				SO_2	.10S**	lb/10^3 gal	AP-42, Section 1.5	1.31E-05	5.75E-05

* Assume 12 months per year because usage would not be restricted by a permit condition
** S = sulfur content in gr/100 ft^3, 0.2

APPENDIX C

Equipment Specifications and Documentation

OPERATION AND PARTS MANUAL

MQ POWER

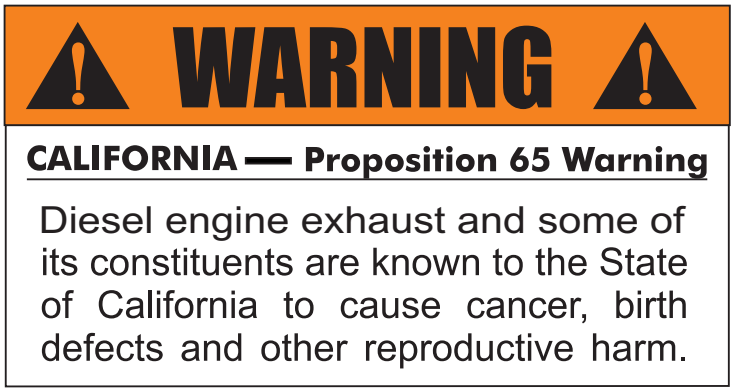
WHISPERWATT™ SERIES
MODEL DCA70SSIU2
60HZ GENERATOR
(ISUZU BJ-4JJ1X DIESEL ENGINE)

PARTS LIST NO. M2870300604

Revision #0 (05/29/09)

To find the latest revision of this publication, visit our website at: www.mqpower.com

THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.


WARNING
CALIFORNIA — Proposition 65 Warning
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

If you believe that your vehicle has a defect that could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Multiquip at 1-800-421-1244.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or Multiquip.

To contact NHTSA, you may either call the Vehicle Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153), go to http://www.nhtsa.dot.gov; or write to:

Administrator
NHTSA
1200 New Jersey Avenue S.E.
Washington, DC 20590

You can also obtain information about motor vehicle safety from http://www.safecar.gov.

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- ❒ **Dealer Name and Address**
- ❒ **Shipping Address (if different than billing address)**
- ❒ **Return Fax Number**
- ❒ **Applicable Model Number**
- ❒ **Quantity, Part Number and Description of Each Part**
- ❒ **Specify Preferred Method of Shipment:**
  - ✓ UPS/Fed Ex
    - Priority One
    - Ground
    - Next Day
    - Second/Third Day
  - ✓ DHL
  - ✓ Truck

NOTICE

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Do not operate or service the equipment before reading the entire manual. Safety precautions should be followed at all times when operating this equipment. Failure to read and understand the safety messages and operating instructions could result in injury to yourself and others.

SAFETY MESSAGES

The four safety messages shown below will inform you about potential hazards that could injure you or others. The safety messages specifically address the level of exposure to the operator and are preceded by one of four words: **DANGER, WARNING, CAUTION** or **NOTICE.**

SAFETY SYMBOLS

DANGER

Indicates a hazardous situation which, if not avoided, **WILL** result in **DEATH** or **SERIOUS INJURY.**

WARNING

Indicates a hazardous situation which, if not avoided, **COULD** result in **DEATH** or **SERIOUS INJURY.**

CAUTION

Indicates a hazardous situation which, if not avoided, **COULD** result in **MINOR** or **MODERATE INJURY.**

NOTICE

Addresses practices not related to personal injury.

Potential hazards associated with the operation of this equipment will be referenced with hazard symbols which may appear throughout this manual in conjunction with safety messages.

Symbol	Safety Hazard
	Lethal exhaust gas hazards
	Explosive fuel hazards
	Burn hazards
	Overspeed hazards
	Rotating parts hazards
	Pressurized fluid hazards
	Electric shock hazards

GENERAL SAFETY

⚠ CAUTION

- **NEVER** operate this equipment without proper protective clothing, shatterproof glasses, respiratory protection, hearing protection, steel-toed boots and other protective devices required by the job or city and state regulations.

- **NEVER** operate this equipment when not feeling well due to fatigue, illness or when under medication.

- **NEVER** operate this equipment under the influence of drugs or alcohol.

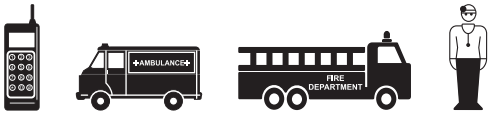
- **ALWAYS** check the equipment for loosened threads or bolts before starting.
- **DO NOT** use the equipment for any purpose other than its intended purposes or applications.

NOTICE

- This equipment should only be operated by trained and qualified personnel 18 years of age and older.
- Whenever necessary, replace nameplate, operation and safety decals when they become difficult read.
- Manufacturer does not assume responsibility for any accident due to equipment modifications. Unauthorized equipment modification will void all warranties.
- **NEVER** use accessories or attachments that are not recommended by MQ Power for this equipment. Damage to the equipment and/or injury to user may result.
- **ALWAYS** know the location of the nearest **fire extinguisher.**

- **ALWAYS** know the location of the nearest **first aid kit.**

- **ALWAYS** know the location of the nearest phone or **keep a phone on the job site.** Also, know the phone numbers of the nearest **ambulance, doctor** and **fire department.** This information will be invaluable in the case of an emergency.



GENERATOR SAFETY

⚠ DANGER

- **NEVER** operate the equipment in an explosive atmosphere or near combustible materials. An explosion or fire could result causing severe **bodily harm or even death.**

⚠ WARNING

- **NEVER** disconnect any **emergency or safety devices.** These devices are intended for operator safety. Disconnection of these devices can cause severe injury, bodily harm or even death. Disconnection of any of these devices will void all warranties.

⚠ CAUTION

- **NEVER** lubricate components or attempt service on a running machine.

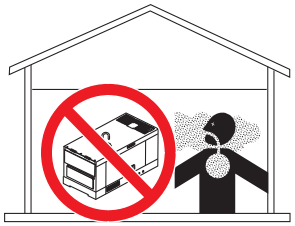
NOTICE

- **ALWAYS** ensure generator is on level ground before use.
- **ALWAYS** keep the machine in proper running condition.
- Fix damage to machine and replace any broken parts immediately.
- **ALWAYS** store equipment properly when it is not being used. Equipment should be stored in a clean, dry location out of the reach of children and unauthorized personnel

ENGINE SAFETY

⚠ DANGER

- The engine fuel exhaust gases contain poisonous carbon monoxide. This gas is colorless and odorless, and can cause death if inhaled.
- The engine of this equipment requires an adequate free flow of cooling air. **NEVER** operate this equipment in any enclosed or narrow area where free flow of the air is restricted. If the air flow is restricted it will cause injury to people and property and serious damage to the equipment or engine.



⚠ WARNING

- **DO NOT** place hands or fingers inside engine compartment when engine is running.
- **NEVER** operate the engine with heat shields or guards removed.
- Keep fingers, hands hair and clothing away from all moving parts to prevent injury.

- **DO NOT** remove the radiator cap while the engine is hot. High pressure boiling water will gush out of the radiator and severely scald any persons in the general area of the generator.

- **DO NOT** remove the coolant drain plug while the engine is hot. Hot coolant will gush out of the coolant tank and severely scald any persons in the general area of the generator.
- **DO NOT** remove the engine oil drain plug while the engine is hot. Hot oil will gush out of the oil tank and severely scald any persons in the general area of the generator.

⚠ CAUTION

- **NEVER** touch the hot exhaust manifold, muffler or cylinder. Allow these parts to cool before servicing equipment.

NOTICE

- **NEVER** run engine without an air filter or with a dirty air filter. Severe engine damage may occur. Service air filter frequently to prevent engine malfunction.
- **NEVER** tamper with the factory settings of the engine or engine governor. Damage to the engine or equipment can result if operating in speed ranges above the maximum allowable.

- Wet stacking is a common problem with diesel engines which are operated for extended periods with light or no load applied. When a diesel engine operates without sufficient load (less than 40% of the rated output), it will not operate at its optimum temperature. This will allow unburned fuel to accumulate in the exhaust system, which can foul the fuel injectors, engine valves and exhaust system, including turbochargers, and reduce the operating performance.

  In order for a diesel engine to operate at peak efficiency, it must be able to provide fuel and air in the proper ratio and at a high enough engine temperature for the engine to completely burn all of the fuel.

  Wet stacking does not usually cause any permanent damage and can be alleviated if additional load is applied to relieve the condition. It can reduce the system performance and increase maintenance. Applying an increasing load over a period of time until the excess fuel is burned off and the system capacity is reached usually can repair the condition. This can take several hours to burn off the accumulated unburned fuel.
- State Health Safety Codes and Public Resources Codes specify that in certain locations, spark arresters must be used on internal combustion engines that use hydrocarbon fuels. A spark arrester is a device designed to prevent accidental discharge of sparks or flames from the engine exhaust. Spark arresters are qualified and rated by the United States Forest Service for this purpose. In order to comply with local laws regarding spark arresters, consult the engine distributor or the local Health and Safety Administrator.

FUEL SAFETY

⚠ DANGER

- **DO NOT** start the engine near spilled fuel or combustible fluids. Diesel fuel is extremely flammable and its vapors can cause an explosion if ignited.
- **ALWAYS** refuel in a well-ventilated area, away from sparks and open flames.
- **ALWAYS** use extreme caution when working with **flammable** liquids.
- **DO NOT** fill the fuel tank while the engine is running or hot.
- **DO NOT** overfill tank, since spilled fuel could ignite if it comes into contact with hot engine parts or sparks from the ignition system.
- Store fuel in appropriate containers, in well-ventilated areas and away from sparks and flames.
- **NEVER** use fuel as a cleaning agent.
- **DO NOT** smoke around or near the equipment. Fire or explosion could result from fuel vapors or if fuel is spilled on a hot engine.

TOWING SAFETY

⚠ CAUTION

- Check with your local county or state safety towing regulations, in addition to meeting ***Department of Transportation (DOT) Safety Towing Regulations,*** before towing your generator.

- Refer to MQ Power trailer manual for additional safety information.
- In order to reduce the possibility of an accident while transporting the generator on public roads, **ALWAYS** make sure the trailer that supports the generator and the towing vehicle are mechanically sound and in good operating condition.
- **ALWAYS** shutdown engine before transporting
- Make sure the hitch and coupling of the towing vehicle are rated equal to, or greater than the trailer "gross vehicle weight rating."
- **ALWAYS** inspect the hitch and coupling for wear. **NEVER** tow a trailer with defective hitches, couplings, chains, etc.
- Check the tire air pressure on both towing vehicle and trailer. ***Trailer tires should be inflated to 50 psi cold***. Also check the tire tread wear on both vehicles.
- **ALWAYS** make sure the trailer is equipped with a **safety chain.**
- **ALWAYS** properly attach trailer's safety chains to towing vehicle.
- **ALWAYS** make sure the vehicle and trailer directional, backup, brake and trailer lights are connected and working properly.
- DOT Requirements include the following:
  - Connect and test electric brake operation.
  - Secure portable power cables in cable tray with tie wraps.
- The maximum speed for highway towing is **55 MPH** unless posted otherwise. Recommended off-road towing is not to exceed **15 MPH** or less depending on type of terrain.
- Avoid sudden stops and starts. This can cause skidding, or jack-knifing. Smooth, gradual starts and stops will improve towing.
- Avoid sharp turns to prevent rolling.
- Trailer should be adjusted to a level position at all times when towing.
- Raise and lock trailer wheel stand in up position when towing.
- Place ***chock blocks*** underneath wheel to prevent **rolling** while parked.
- Place **support blocks** underneath the trailer's bumper to prevent **tipping** while parked.
- Use the trailer's swivel jack to adjust the trailer height to a level position while parked.

ELECTRICAL SAFETY

⚠ DANGER

- **DO NOT** touch output terminals during operation. Contact with output terminals during operation can cause **electrocution, electrical shock or burn.**

- The electrical voltage required to operate the generator can cause severe injury or even death through physical contact with live circuits. Turn generator and all circuit breakers **OFF** before performing maintenance on the generator or making contact with output terminals.

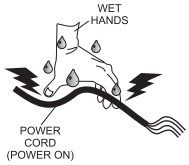
- **NEVER** insert any objects into the output receptacles during operation. This is extremely dangerous. The possibility exists of **electrical shock, electrocution or death.**

- Backfeed to a utility system can cause **electrocution** and/or property damage. **NEVER** connect the generator to a building's electrical system without a transfer switch or other approved device. All installations should be performed by a **licensed electrician** in accordance with all applicable laws and electrical codes. Failure to do so could result in electrical shock or burn, causing **serious injury or even death.**

Power Cord/Cable Safety

⚠ DANGER

- **NEVER** let power cords or cables **lay in water.**
- **NEVER stand in water** while AC power from the generator is being transferred to a load.
- **NEVER** use **damaged** or **worn** cables or cords when connecting equipment to generator. Inspect for cuts in the insulation.
- **NEVER** grab or touch a live power cord or cable with wet hands. The possibility exists of **electrical shock, electrocution or death.**



- Make sure power cables are securely connected to the generator's output receptacles. Incorrect connections may cause electrical shock and damage to the generator.

NOTICE

- **ALWAYS** make certain that proper power or extension cord has been selected for the job. See Cable Selection Chart in this manual.

Grounding Safety

⚠ DANGER

- **ALWAYS** make sure that electrical circuits are properly grounded to a suitable earth ground (ground rod) per the National Electrical Code (NEC) and local codes before operating generator. **Severe injury or death by electrocution** can result from operating an ungrounded generator.
- **NEVER** use gas piping as an electrical ground.

BATTERY SAFETY

DANGER

- **DO NOT** drop the battery. There is a possibility that the battery will explode.
- **DO NOT** expose the battery to open flames, sparks, cigarettes, etc. The battery contains combustible gases and liquids. If these gases and liquids come into contact with a flame or spark, an explosion could occur.

WARNING

- **ALWAYS** wear safety glasses when handling the battery to avoid eye irritation. The battery contains acids that can cause injury to the eyes and skin.

- Use well-insulated gloves when picking up the battery.
- **ALWAYS** keep the battery charged. If the battery is not charged, combustible gas will build up.
- **ALWAYS** recharge the battery in a well-ventilated environment to avoid the risk of a dangerous concentration of combustible gasses.
- If the battery liquid (dilute sulfuric acid) comes into contact with **clothing or skin**, rinse skin or clothing immediately with plenty of water.
- If the battery liquid (dilute sulfuric acid) comes into contact with **eyes**, rinse eyes immediately with plenty of water and contact the nearest doctor or hospital to seek medical attention.

CAUTION

- **ALWAYS** disconnect the **NEGATIVE battery terminal** before performing service on the generator.
- **ALWAYS** keep battery cables in good working condition. Repair or replace all worn cables.

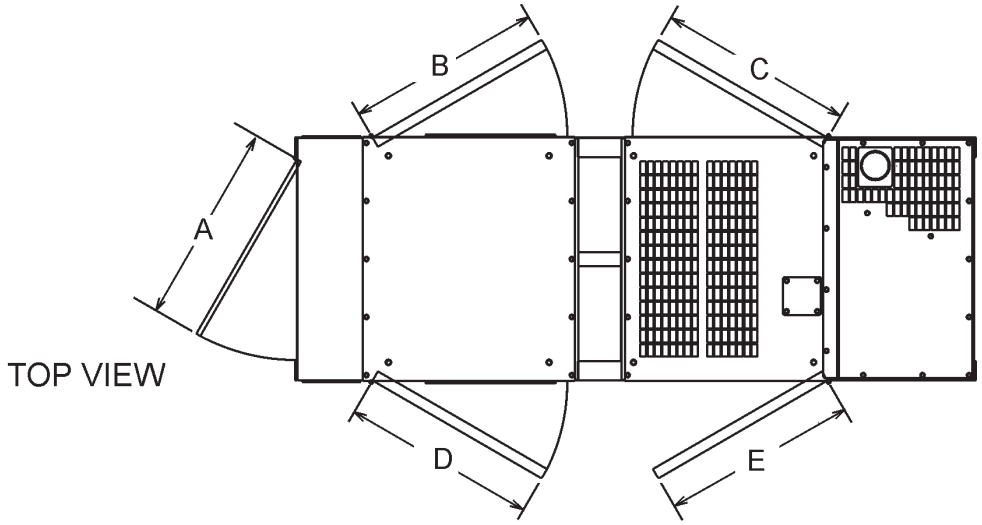
ENVIRONMENTAL SAFETY

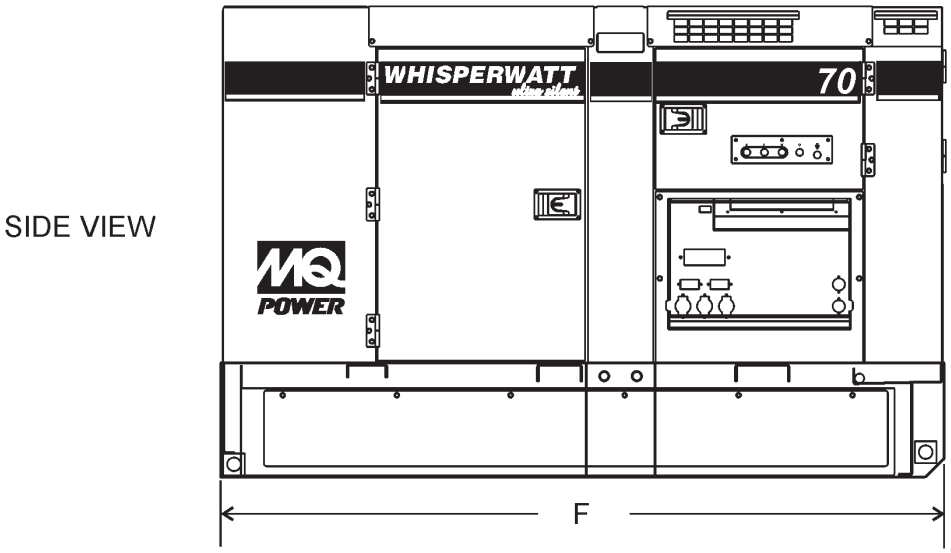
NOTICE

- Dispose of hazardous waste properly. Examples of potentially hazardous waste are used motor oil, fuel and fuel filters.

- **DO NOT** use food or plastic containers to dispose of hazardous waste.
- **DO NOT** pour waste, oil or fuel directly onto the ground, down a drain or into any water source.

Table 1. Generator Specifications		
Model	DCA-70SSIU2	
Type	Revolving field, self ventilated, open protected type synchronous generator	
Armature Connection	**Star with Neutral**	**Zigzag**
Phase	3	Single
Standby Output	77 kVA (62 kW)	44 KW
Prime Output	70 kVA (56 KW)	40 KW
Voltage	240 or 480V	240 or 120V
Frequency	60 Hz	
Speed	1800 rpm	
Power Factor	0.8	1.0
Aux. AC Power	Single Phase, 60 Hz	
Voltage	120V	
Output	4.8 Kw (2.4 kW x 2)	
Weight (No Fuel)	2,701 lbs. (1,225 kg.)	
Weight (Fuel)	3,035 lbs. (1,376 kg.)	
Table 2. Engine Specifications		
Model	ISUZU BJ4JJ1X Tier 3	
Type	4 cycle, water-cooled, direct injection, turbo-charged	
No. of Cylinders	4 cylinders	
Bore x Stroke	3.76 in. x 4.13 in. (95.4 mm x 105 mm)	
Displacement	183 cu. in. (3,000 cc)	
Rated Output	85 HP/1800 RPM	
Starting	Electric	
Coolant Capacity	3.09 gal. (11.7 liters)	
Lube Oil Capacity	3.96 gal. (15.0 liters)	
Fuel Type	#2 Diesel Fuel	
Fuel Tank Capacity	40 gal. (150 liters)	
Fuel Consumption	4.1 gal. (15.4 L)/hr at **full load**	3.1 gal. (11.9 L)/hr at **3/4 load**
	2.2 gal. (8.40 L)/hr at **1/2 load**	1.4 gal. (5.20 L)/hr at **1/4 load**
Battery	12V 72Ah x 1	





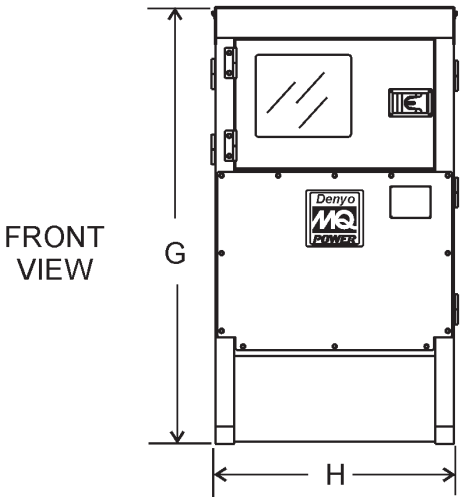


Figure 1. Dimensions

Table 3. Dimensions

Reference Letter	Dimension in. (mm)	Reference Letter	Dimension in. (mm)
A	30.31 in. (770 mm.)	F	94.49 in. (2,400 mm.)
B	30.50 in. (775 mm.)	G	55.12 in. (1,400 mm.)
C	35.80 in. (910 mm.)	H	35.43 in. (900 mm.)
D	30.50 in. (775 mm.)		
E	35.80 in. (910 mm.)		

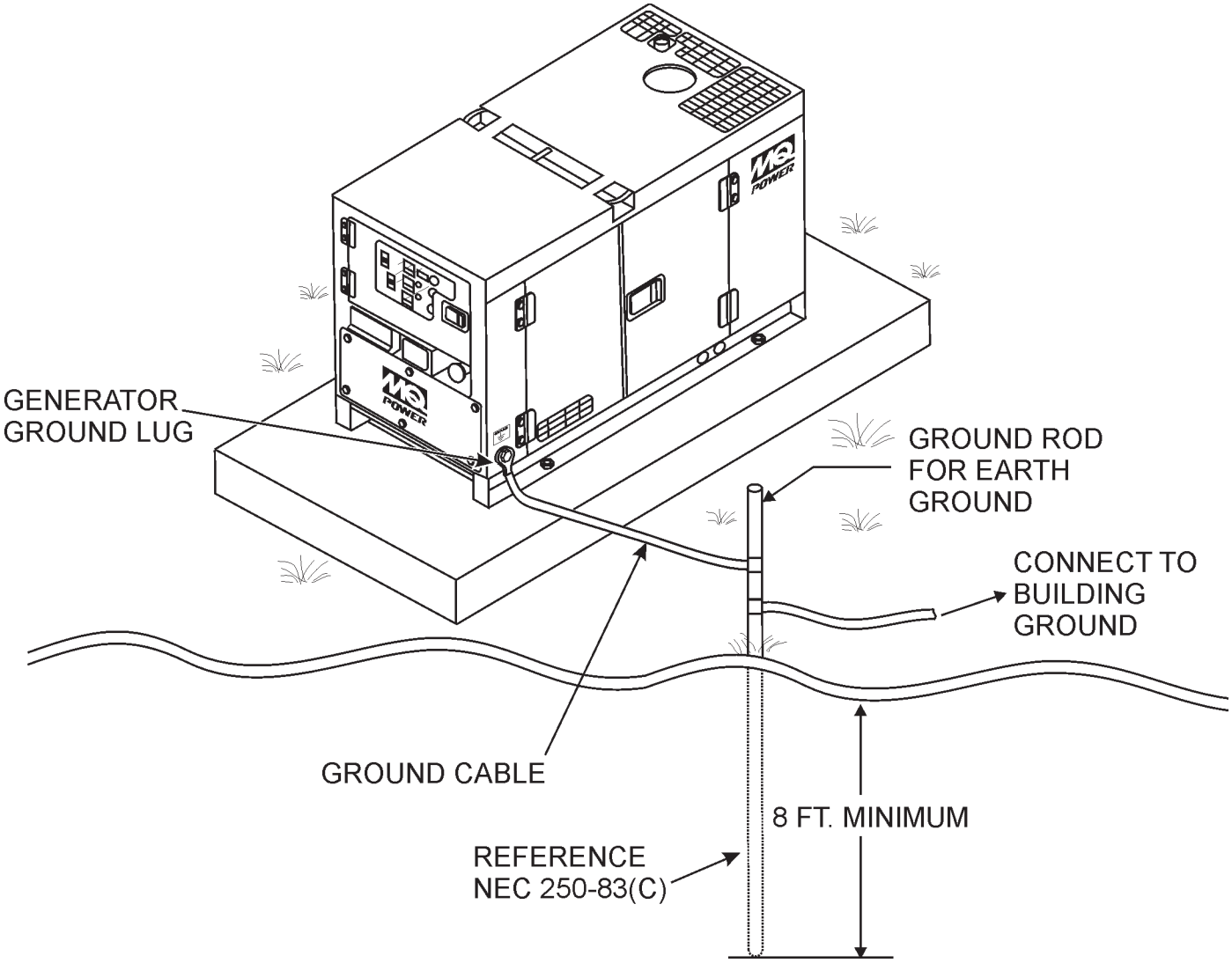


Figure 2. Typical Generator Grounding Application

OUTDOOR INSTALLATION

Install the generator in a area that is free of debris, bystanders, and overhead obstructions. Make sure the generator is on secure level ground so that it cannot slide or shift around. Also install the generator in a manner so that the exhaust will not be discharged in the direction of nearby homes.

The installation site must be relatively free from moisture and dust. All electrical equipment should be protected from excessive moisture. Failure to do will result in deterioration of the insulation and will result in short circuits and grounding.

Foreign materials such as dust, sand, lint and abrasive materials have a tendency to cause excessive wear to engine and alternator parts.

⚠ CAUTION

Pay close attention to ventilation when operating the generator inside tunnels and caves. The engine exhaust contains noxious elements. Engine exhaust must be routed to a ventilated area.

INDOOR INSTALLATION

Exhaust gases from diesel engines are extremely poisonous. Whenever an engine is installed indoors the exhaust fumes must be vented to the outside. The engine should be installed at least two feet from any outside wall. Using an exhaust pipe which is too long or too small can cause excessive back pressure which will cause the engine to heat excessively and possibly burn the valves.

MOUNTING

The generator must be mounted on a solid foundation (such as concrete) and set firmly on the foundation to isolate vibration of the generator when it is running. The generator must set at least 6 inches above the floor or grade level (in accordance to NFPA 110, Chapter 5-4.1). **DO NOT** remove the metal skids on the bottom of the generator. They are to resist damage to the bottom of the generator and to maintain alignment.

GENERATOR GROUNDING

To guard against electrical shock and possible damage to the equipment, it is important to provide a good **EARTH** ground.

Article 250 (Grounding) of the National Electrical Code (NEC) provides guide lines for proper grounding and specifies that the cable ground shall be connected to the grounding system of the building as close to the point of cable entry as practical.

NEC articles 250-64(b) and 250-66 set the following grounding requirements:

1. Use one of the following wire types to connect the generator to earth ground.
   a. Copper - 10 AWG (5.3 mm2) or larger.
   b. Aluminum - 8 AWG (8.4 mm2) or larger.
2. When grounding the generator (Figure 2) connect the ground cable between the lock washer and the nut on the generator and tighten the nut fully. Connect the other end of the ground cable to earth ground.
3. NEC article 250-52(c) specifies that the earth ground rod should be buried a minimum of 8 ft. into the ground.

NOTICE

When connecting the generator to any buildings electrical system **ALWAYS** consult with a licensed electrician.

GENERATOR

The MQ Power Model DCA70SSIU2 generator (Figure 3) is a high quality portable (requires a trailer for transport) power source for telecom sites, lighting facilities, power tools, submersible pumps and other industrial and construction machinery.

ENGINE OPERATING PANEL

The "Engine Operating Panel" is provided with the following:

- Tachometer
- Water Temperature Gauge
- Warning Lamp
- Pre-Heat Lamp
- Oil Pressure Gauge
- Charging Ammeter Gauge
- Fuel Level Gauge
- Panel Light/Panel Light Switch
- ECU Controller
- Engine Speed Switch

GENERATOR CONTROL PANEL

The "Generator Control Panel" is provided with the following:

- Frequency Meter (Hz)
- AC Ammeter (Amps)
- AC Voltmeter (Volts)
- Ammeter Change-Over Switch
- Voltmeter Change-Over Switch
- Voltage Regulator
- 3-Pole, 175 amp Main Circuit Breaker
- "Control Box" (located behind the Gen. Control Panel)
  - Automatic Voltage Regulator
  - Current Transformer
  - Over-Current Relay
  - Starter Relay
  - Voltage Selector Switch

OUTPUT TERMINAL PANEL

The "Output Terminal Panel" is provided with the following:

- Three 120/240V output receptacles (CS-6369), 50A
- Three auxiliary circuit breakers, 50A
- Two 120V output receptacles (GFCI), 20A
- Two GFCI circuit breakers, 20A
- Five output terminal lugs (3Ø power)

OPEN DELTA EXCITATION SYSTEM

This generator is equipped with the state of the art **"Open-Delta"** excitation system. The open delta system consist of an electrically independent winding wound among stationary windings of the AC output section.

There are four connections of the open delta A, B, C and D. During steady state loads, the power from the voltage regulator is supplied from the parallel connections of A to B, A to D, and C to D. These three phases of the voltage input to the voltage regulator are then rectified and are the excitation current for the exciter section.

When a heavy load, such as a motor starting or a short circuit occurs, the automatic voltage regulator (AVR) switches the configuration of the open delta to the series connection of B to C. This has the effect of adding the voltages of each phase to provide higher excitation to the exciter section and thus better voltage response during the application of heavy loads.

The connections of the AVR to the AC output windings are for sensing only. No power is required from these windings.

The open-delta design provides virtually unlimited excitation current, offering maximum motor starting capabilities. The excitation does not have a **"fixed ceiling"** and responds according the demands of the required load.

ENGINE

This generator unit incorporates an ISUZU BJ-4JJ1X diesel engine. This engine is designed to meet every performance requirement for the generator. Reference Table 2 for engine specifications.

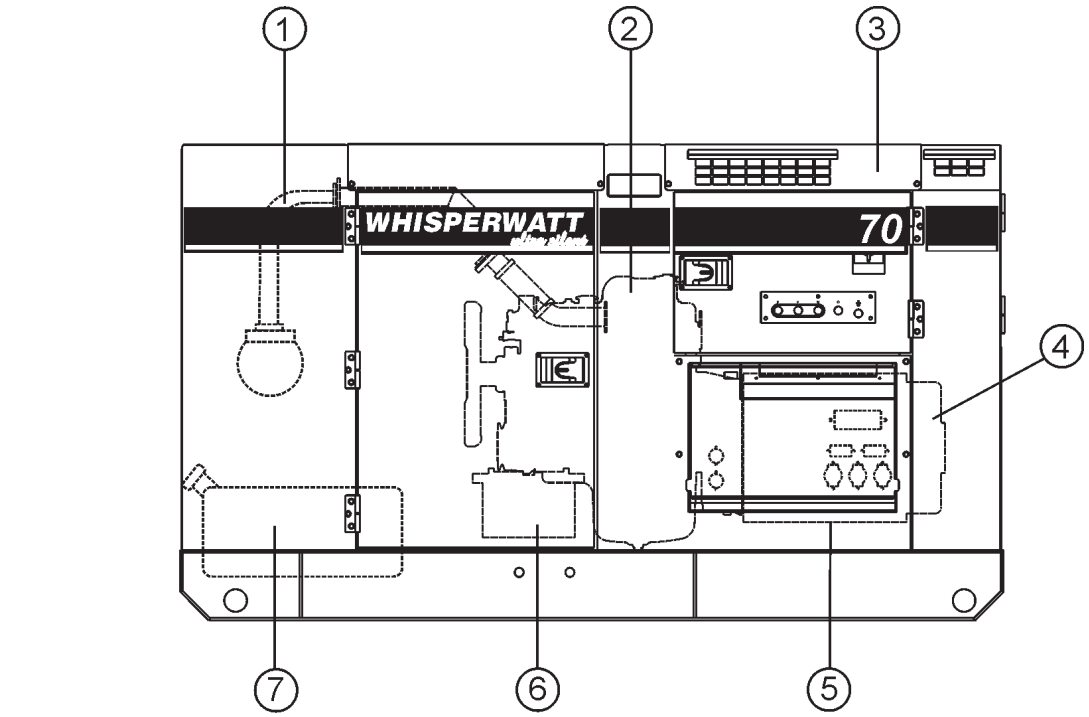
In keeping with MQ Power's policy of constantly improving its products, the specifications quoted herein are subject to change without prior notice.

ELECTRIC GOVERNOR SYSTEM

The electric governor system controls the RPMs of the engine. When the engine demand increases or decreases, the governor system regulates the frequency variation to ±.25%.

EXTENSION CABLES

When electric power is to be provided to various tools or loads at some distance from the generator, extension cords are normally used. Cables should be sized to allow for distance in length and amperage so that the voltage drop between the generator and point of use (load) is held to a minimum. Use the cable selection chart (Table 6) as a guide for selecting proper extension cable size.



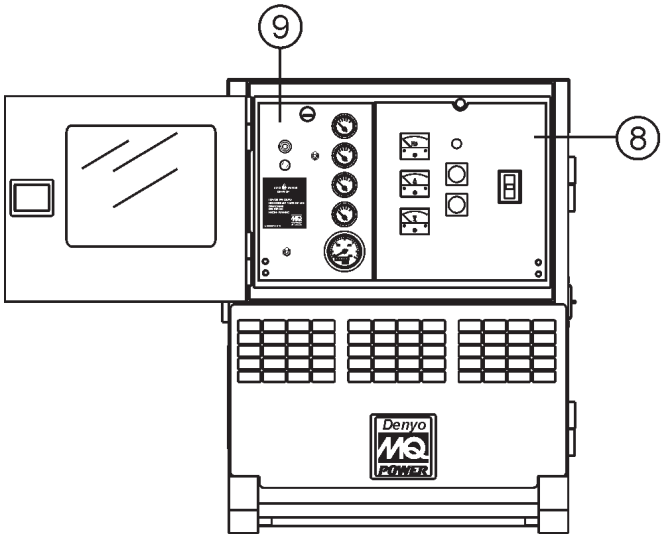


Table 4. Generator Major Components	
ITEM NO.	DESCRIPTION
1	Muffler Assembly
2	Engine Assembly
3	Enclosure Assembly
4	Generator Assembly
5	Output Terminal Assembly
6	Battery Assembly
7	Fuel Tank Assembly
8	Generator Control Panel Assembly
9	Engine Operating Panel Assembly

Figure 3. Major Components

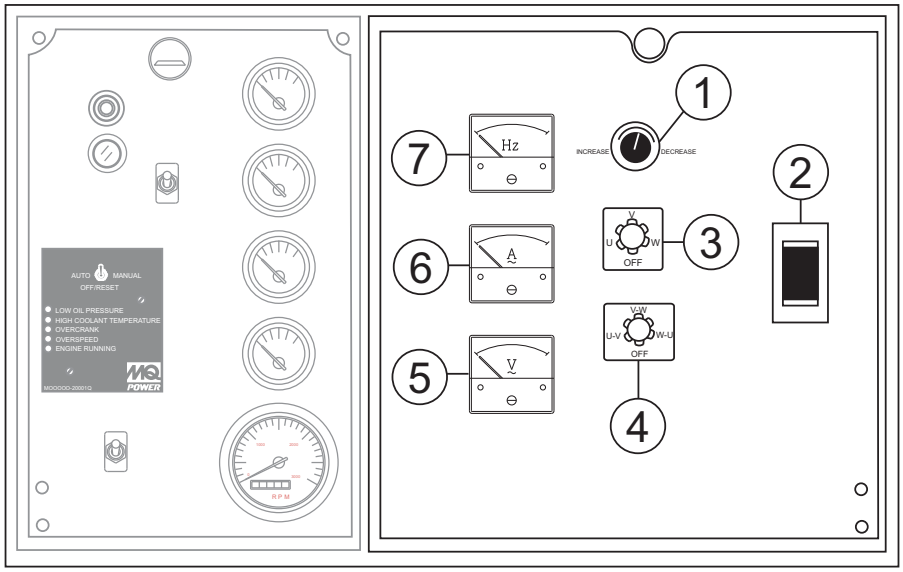


Figure 4. Generator Control Panel

The definitions below describe the controls and functions of the Generator Control Panel (Figure 4).

1. **Voltage Regulator Control** — Allows ±15% manual adjustment of the generator's output voltage.
2. **Main Circuit Breaker**—This three-pole, 175A main breaker is provided to protect the the U,V, and W Output Terminal Lugs from overload.
3. **Ammeter Change-Over Switch** — This switch allows the AC ammeter to indicate the current flowing to the load connected to any phase of the output terminals, or to be switched off. This switch does not effect the generator output in any fashion, it is for current reading only.
4. **Voltmeter Change-Over Switch** — This switch allows the AC voltmeter to indicate phase to phase voltage between any two phases of the output terminals or to be switched off.
5. **AC Voltmeter** — Indicates the output voltage present at the U,V, and W Output Terminal Lugs.
6. **AC Ammeter** — Indicates the amount of current the load is drawing from the generator per leg selected by the ammeter phase-selector switch.
7. **Frequency Meter** — Indicates the output frequency in hertz (Hz). Normally 60 Hz.

Located behind the generator control panel is the Generator Control Box. This box contains some of the necessary electronic components required to make the generator function.

The Control Box is equipped with the following major components:

- Over-Current Relay
- Automatic Voltage Regulator (AVR)
- Starter Relay
- Current Transformer
- Voltage Selector Switch
- Main Circuit Breaker

NOTICE

Remember the **overcurrent relay** monitors the current flowing from the **U,V, and W Output Terminal Lugs** to the load.

In the event of a short circuit or over current condition, it will automatically trip the 175 amp main breaker.

To restore power to the **Output Terminal Panel**, press the reset button on the overcurrent relay and place the **main** circuit breaker in the **closed** position (**ON**).

NOTES

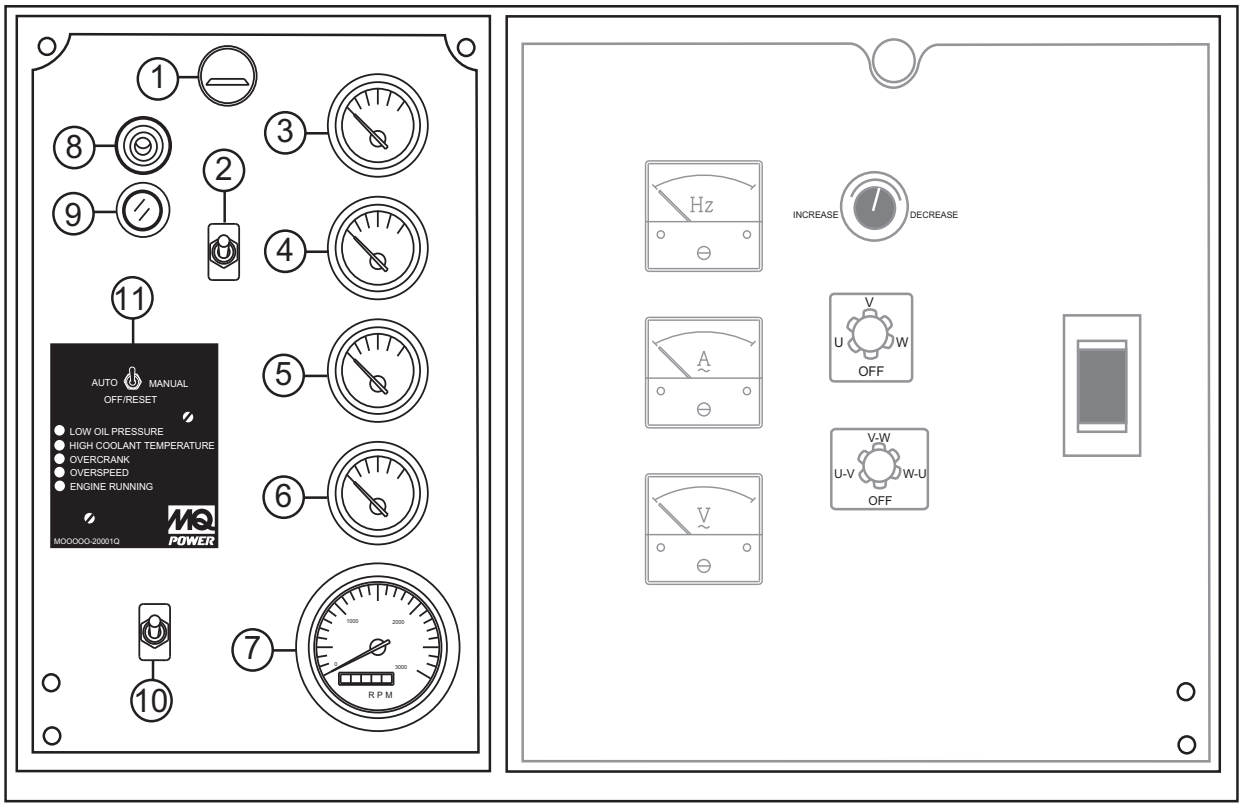
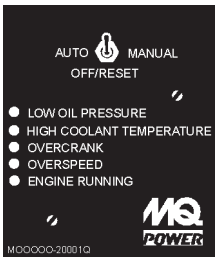


Figure 5. Engine Operating Panel

The definitions below describe the controls and functions of the Engine Operating Panel (Figure 5).

1. **Panel Light** — Normally used in dark areas or at night time. When activated, panel lights will illuminate. When the generator is not in use be sure to turn the panel light switch to the OFF position.
2. **Panel Light Switch** — When activated will turn on control panel light.
3. **Oil Pressure Gauge** — During normal operation this gauge should read between 42 ~71 psi. (290~490 kPa). When starting the generator the oil pressure may read a little higher, but after the engine warms up the oil pressure should return to the correct pressure range.
4. **Water Temperature Gauge** — During normal operation this gauge be should read between 167°~203°F (75° ~95°C
5. **Charging Ammeter Gauge** — Indicates the current being supplied by the engine's alternator which provides current for generator's control circuits and battery charging system.
6. **Fuel Gauge** — Indicates amount of diesel fuel available.
7. **Tachometer** — Indicates engine speed in RPM's for 60 Hz operation. This meter should indicate 1800 RPM's when the rated load is applied. In addition a built in hour meter will record the number of operational hours that the generator has been in use.
8. **Preheat Lamp** — As the engine cranks, this lamp will illuminate to indicate automatic preheating of the engine glow plugs. When the lamp turns off, this indicates that the preheat cycle is complte and the engine will start automatically.
9. **Warning Lamp** — This lamp will illuminate when a critical engine fault has occured.
10. **Engine Speed Switch** — This switch controls the speed of the engine (low/high).
11. **Auto START/STOP Engine Controller (ECU)** — This controller has a vertical row of status LED's (inset), that when lit, indicate that an engine malfunction (fault) has been detected. When a fault has been detected the engine controller will evaluate the fault and all major faults will shutdown the generator. During cranking cycle, the ECU will attempt to crank the engine for 10 seconds before disengaging.



If the engine does not engage (start) by the third attempt, the engine will be shutdown by the engine controller's Over Crank Protection mode. If the engine engages at a speed (RPM's) that is not safe, the controller will shutdown the engine by initializing the Over Speed Protection mode.

Also the engine controller will shut down the engine in the event of low oil pressure, high coolant temperature, low coolant level, and loss of magnetic pickup. These conditions can be observed by monitoring the LED status indicators on the front of the controller module.

A. **MPEC Control Switch** — This switch controls the running of the unit. If this switch is set to the OFF/ RESET position, the unit will not run. When this switch is set to the manual position, the generator will start immediately.

If the generator is to be connected to a building's AC power source via an automatic transfer switch (isolation), place the switch in the AUTO position. In this position, should an outage occur, the automatic transfer switch (ATS) will start the generator automatically via the generator's auto-start contacts connected to the ATS's start contacts. Please refer to your ATS installation manual for further instructions for the correct installation of the auto-start contacts of the generator to the ATS.

B. **Low Oil Pressure** — Indicates the engine pressure has fallen below 15 psi (103 kPa). The oil pressure is detected using variable resistive values from the oil pressure sending unit. This is considered a major fault.

C. **High Coolant Temperature** — Indicates the engine temperature has exceeded 230°F (110°C). The engine temperature is detected using variable resistive values from the temperature sending unit. This is considered a major fault.

D. **Overcrank Shutdown** — Indicates the unit has attempted to start a pre- programmed number of times, and has failed to start. The number of cycles and duration are programmable. It is pre-set at 3 cycles with a 10 second duration. This is considered a major fault.

E. **Overspeed Shutdown** — Indicates the engine is running at an unsafe speed. This is considered a major fault.

F. **Engine Running** — Indicates that engine is running at a safe operating speed.

OUTPUT TERMINAL PANEL

The Output Terminal Panel (Figure 6) shown below is located on the right-hand side (left from control panel) of the generator. Lift up on the cover to gain access to receptacles and terminal lugs.

NOTICE

Terminal legs "O" and "Ground" are considered bonded grounds.

OUTPUT TERMINAL FAMILIARIZATION

The "Output Terminal Panel " (Figure 6) is provided with the following:

- Three 120/240V output receptacles @ 50 amp
- Three Circuit Breakers @ 50 amps
- Two 120V GFCI receptacles @ 20 amp
- Two GFCI Circuit Breakers @ 20 amps
- Five Output Terminal Lugs (U, V, W, O, Ground)

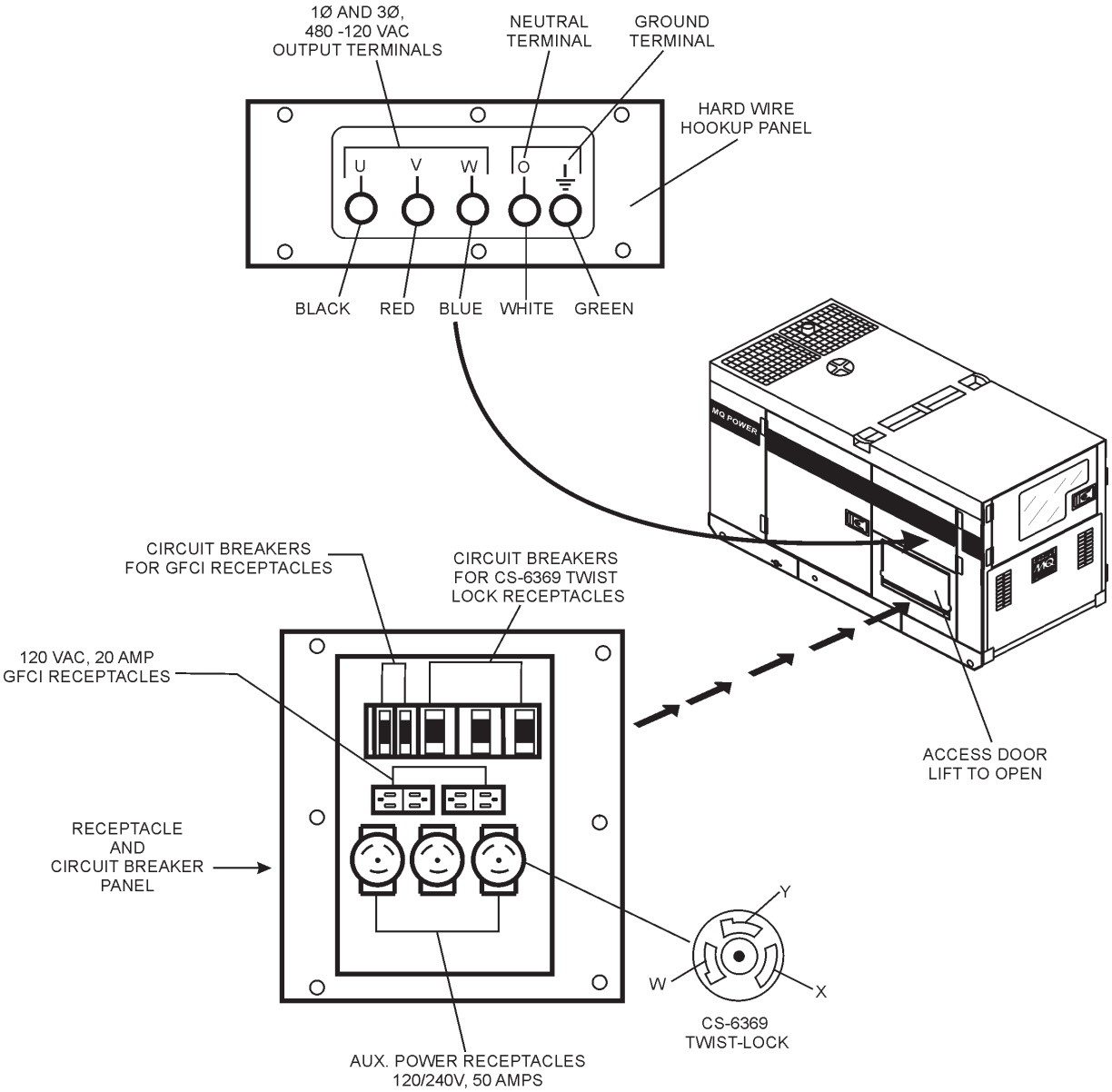


Figure 6. Output Terminal Panel

120 VAC GFCI Receptacles

There are two 120 VAC, 20 amp GFCI (Duplex Nema 5-20R) receptacles provided on the output terminal panel. These receptacles can be accessed in **any voltage selector switch** position. Each receptacle is protected by a 20 amp circuit breaker. These breakers are located directly above the GFCI receptacles. Remember the load output (current) of both GFCI receptacles is dependent on the load requirements of the U, V, and W output terminal lugs.

Pressing the **reset** button resets the GFCI receptacle after being tripped. Pressing the **test button** (See Figure 7) in the center of the receptacle will check the GFCI function. Both receptacles should be tested at least once a month.

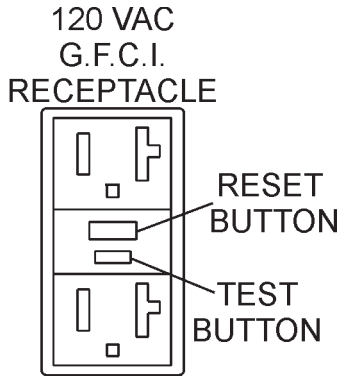


Figure 7. G.F.C.I. Receptacle

Twist Lock Dual Voltage 120/240 VAC Receptacles

There are three 120/240V, 50 amp auxiliary twist-lock (CS-6369) receptacles (Figure 8) provided on the output terminal panel. These receptacles can **only** be accessed when the voltage selector switch is placed in the **single-phase 240/120 position.**

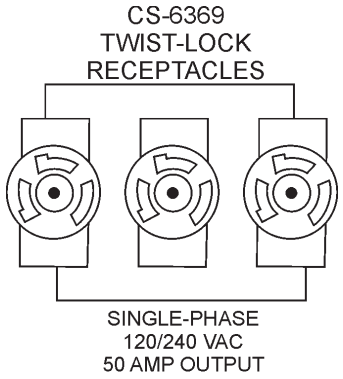


Figure 8. 120/240V Twist-Lock Auxiliary Receptacles

Each auxiliary receptacle is protected by a 50 amp circuit breaker. These breakers are located directly above the GFCI receptacles. Remember the load output (current) on all three receptacles is dependent on the load requirements of the **Output Terminal Lugs.**

Turn the **voltage regulator control knob** (Figure 9) on the control panel to obtain the desired voltage. Turning the knob clockwise will **increase** the voltage, turning the knob counter-clockwise will **decrease** the voltage.

Figure 9. Voltage Regulator Control Knob

Removing the Plastic Face Plate (Hard Wire Hookup Panel)

The ***Output Terminal Lugs*** are protected by a plastic face plate cover (Figure 10). Un-screw the securing bolts and lift the plastic terminal cover to gain access to the terminal enclosure.

After the load wires have been securely attached to the terminal lugs, reinstall the plastic face plate.

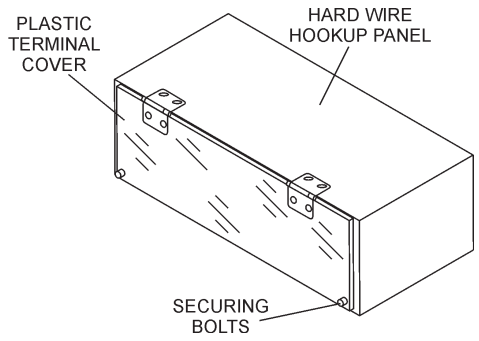


Figure 10. Plastic Face Plate (Output Terminal Lugs)

Connecting Loads

Loads can be connected to the generator by the **Output Terminal Lugs** or the convenience receptacles (Figure 11). Make sure to read the operation manual before attempting to connect a load to the generator.

To protect the output terminals from overload, a 3-pole, 175A **main** circuit breaker is provided. Make sure to switch **ALL** circuit breakers to the **OFF** position prior to starting the engine.

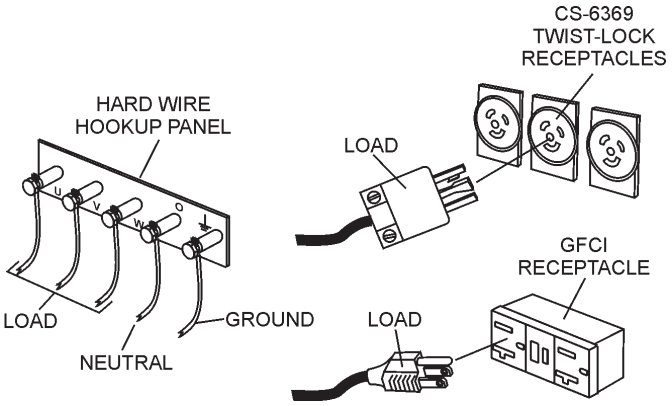


Figure 11. Connecting Loads

Over Current Relay

An **over current relay** (Figure 12) is connected to the main circuit breaker. In the event of an overload, both the circuit breaker and the over current relay may trip. If the circuit breaker can not be reset, the **reset button** on the over current relay must be pressed. The over current relay is located in the control box.

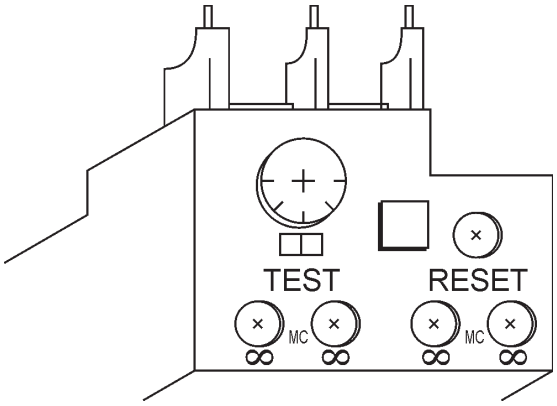


Figure 12. Over Current Relay

SINGLE PHASE LOAD

Always be sure to check the nameplate on the generator and equipment to insure the wattage, amperage, frequency, and voltage requirements are satisfactorily supplied by the generator for operating the equipment.

Generally, the wattage listed on the nameplate of the equipment is its rated output. Equipment may require 130—150% more wattage than the rating on the nameplate, as the wattage is influenced by the efficiency, power factor and starting system of the equipment.

NOTICE

If wattage is not given on the equipment's name plate, approximate wattage may be determined by multiplying nameplate voltage by the nameplate amperage.

WATTS = VOLTAGE x AMPERAGE

The power factor of this generator is 0.8. See Table 5 below when connecting loads.

Table 5. Power Factor By Load

Type of Load	Power Factor
Single-phase induction motors	0.4-0.75
Electric heaters, incandescent lamps	1.0
Fluorescent lamps, mercury lamps	0.4-0.9
Electronic devices, communication equipment	1.0
Common power tools	0.8

Table 6. Cable Selection (60 Hz, Single Phase Operation)

Current in Amperes	Load in Watts		Maximum Allowable Cable Length			
	At 100 Volts	At 200 Volts	#10 Wire	#12 Wire	#14 Wire	#16 Wire
2.5	300	600	1000 ft.	600 ft.	375 ft.	250 ft.
5	600	1200	500 ft.	300 ft.	200 ft.	125 ft.
7.5	900	1800	350 ft.	200 ft.	125 ft.	100 ft.
10	1200	2400	250 ft.	150 ft.	100 ft.	
15	1800	3600	150 ft.	100 ft.	65 ft.	
20	2400	4800	125 ft.	75 ft.	50 ft.	
CAUTION: Equipment damage can result from low voltage						

THREE PHASE LOAD

When calculating the power requirements for 3-phase power use the following equation:

$$KVA = \frac{VOLTAGE \times AMPERAGE \times 1.732}{1000}$$

NOTICE

If 3Ø load (kVA) is not given on the equipment nameplate, approximate 3Ø load may be determined by multiplying voltage by amperage by 1.732.

NOTICE

Motors and motor-driven equipment draw much greater current for starting than during operation.

An inadequate size connecting cable which cannot carry the required load can cause a voltage drop which can burn out the appliance or tool and overheat the cable. See Table 6.

- When connecting a resistance load such as an incandescent lamp or electric heater, a capacity of up to the generating set's rated output (kW) can be used.
- When connecting a fluorescent or mercury lamp, a capacity of up to the generating set's rated output (kW) multiplied by 0.6 can be used.
- When connecting an electric drill or other power tools, pay close attention to the required starting current capacity.

When connecting ordinary power tools, a capacity of up to the generating set's rated output (kW) multiplied by 0.8 can be used.

DANGER

Before connecting this generator to any building's electrical system, a **licensed electrician** must install an **isolation (transfer) switch**. Serious damage to the building's electrical system may occur without this transfer switch.

GENERATOR OUTPUT VOLTAGES

A wide range of voltages are available to supply voltage for many different applications. Voltages are selected by using the **voltage selector** switch (Figure 13). To obtain some of the voltages as listed in Table 7 (see below) will require a fine adjustment using the **voltage regulator** (VR) **control knob** located on the control panel.

Voltage Selector Switch

The voltage selector switch (Figure 13) is located above the output terminal panel's Hard Wire Hook-up Panel. It has been provided for ease of voltage selection.

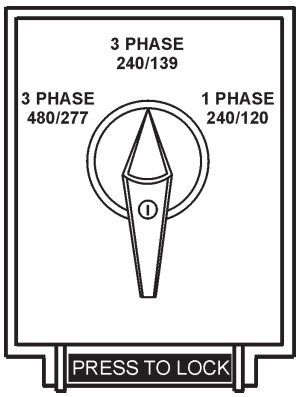


Figure 13. Voltage Change-Over Board

Voltage Selector Switch Locking Button

The voltage selector switch has a locking button to protect the generator and load from being switched while the engine is running. To lock the voltage selector switch, press and hold the red button located at the bottom of the switch.

⚠ CAUTION

NEVER change the position of the **voltage selector switch** while the engine is running. **ALWAYS** place circuit breaker in the **OFF** position before selecting voltage.

Table 7. Voltages Available						
Three Phase (Switchable)	208V	220V	240V	416V	440V	480V
Single Phase (Switchable)	120V	1127V	139V	240V	254V	277V

Generator Amperage

Table 8 shows the **maximum** amps the generator can provide. **DO NOT** exceed the maximum amps as listed..

Table 8. Generator Maximum Amps	
Rated Voltage	**Maximum Amps**
1Ø 120 Volt	155.5 X 2 amps (4 wire)
1Ø 240 Volt	78.8 amps (4 wire)
3Ø 240 Volt	168 amps
3Ø 480 Volt	84 amps

GFCI Receptacle Load Capability

The load capability of the GFCI receptacles is directly related to the voltage being supplied at either the output terminals or the 2 twist lock auxiliary receptacles.

Tables 9 and 10 show what amount of current is available at the GFCI receptacles when the output terminals and twist lock receptacles are in use. Be careful that your load does not to exceed the available current capability at the receptacles.

Table 9. 1Ø GFCI Receptacle Load Capacity	
KW in Use Twist Lock (C6369)	**Available Load Current (Amps)**
1Ø 240/120V	GFCI Duplex 5-20R 120V
40.4	0
39.2	5 amps/receptacle
38.0	10 amps/receptacle
38.6	15 amps/receptacle
35.6	20 amps/receptacle

Table 10. 3Ø Generator Maximum Amps	
KVA in Use (UVWO Terminals)	**Available Load Current (Amps)**
3Ø 240/480V	GFCI Duplex 5-20R 120V
70	0 amps/receptacle
65.8	5 amps/receptacle
61.7	10 amps/receptacle
57.5	15 amps/receptacle
53.4	20 amps/receptacle

HOW TO READ THE AC AMMETER AND AC VOLTAGE GAUGES

The AC ammeter and AC voltmeter gauges are controlled by the AC ammeter and AC voltmeter change-over switches.

Both of these switches are located on the control panel and **DO NOT** effect the generator output. They are provided to help observe how much power is being supplied, produced at the UVWO terminals lugs.

Before taking a reading from either gauge, set the ***Voltage Selector Switch*** (Figure 14) to the position which produces the required voltage (For example, for 3Ø 240V, choose the center 3Ø 240/139V position on the voltage selector switch).

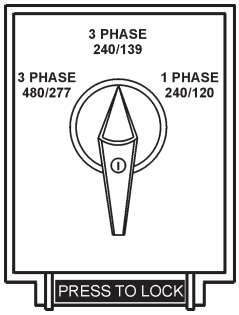


Figure 14. Voltage Selector Switch
240/139V 3Ø Positio

NOTICE

For 3Ø 208V/1Ø,120V, place the Voltage Selector Switch in the 3 Phase 240/139 position.

AC Voltmeter Gauge Reading

Place the ***AC Voltmeter Change-Over Switch*** (Figure 15) in the W-U position and observe the phase to phase voltage reading between the W and U terminals as indicated on the ***AC Voltmeter Gauge*** (Figure 16)

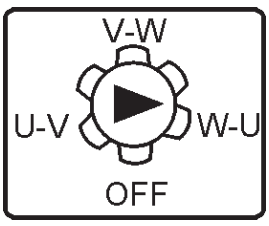


Figure 15. AC Voltmeter Change-Over Switch

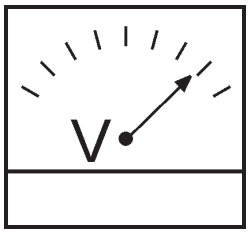


Figure 16. AC Voltmeter Gauge

AC Ammeter Gauge Reading

Place the ***AC Ammeter Change-Over Switch*** (Figure 17) in the U position and observe the current reading (load drain) on the U terminal as indicated on the ***AC Ammeter Gauge*** (Figure 18). This process can be repeated for terminals V and W.

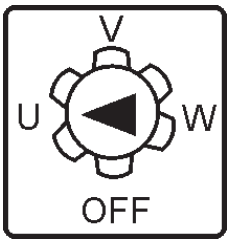


Figure 17. AC Ammeter Change-Over Switch

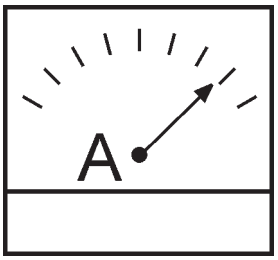


Figure 18. AC Ammeter (Amp Reading on U Lug)

NOTICE

The ***ammeter*** gauge will only show a reading when the ***Output Terminal Lugs*** are connected to a load and in use.

UVWO TERMINAL OUTPUT VOLTAGES

Various output voltages can be obtained using the UVWO output terminal lugs. The voltages at the terminals are dependent on the position of the **Voltage Selector Switch** and the adjustment of the **Voltage Regulator Control Knob**.

Remember the voltage selector switch determines the **range** of the output voltage. The voltage regulator (VR) allows the user to increase or decrease the selected voltage.

3Ø-240/139 UVWO Terminal Output Voltages

1. Place the voltage selector switch in the 3Ø 240/139 position as shown in Figure 19..

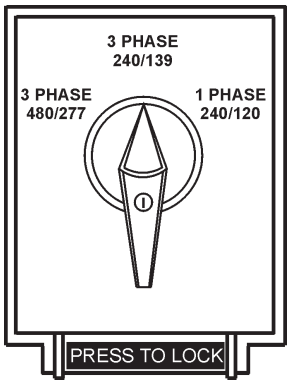


Figure 19. Voltage Selector Switch 3Ø-240/139V Position

2. Connect the load wires to the UVWO terminals as shown in Figure 20.

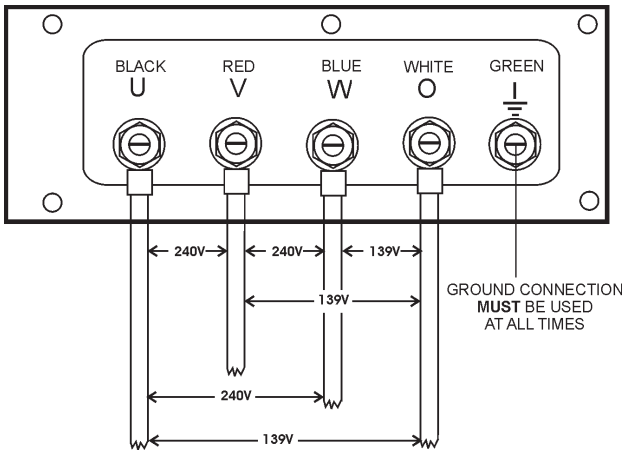


Figure 20. UVWO Terminal Lugs 3Ø-240/139V Connections

3. Turn the voltage regulator knob (Figure 21) clockwise to increase voltage output, turn counterclockwise to decrease voltage output. Use voltage regulator adjustment knob whenever fine tuning of the output voltage is required.

Figure 21. Voltage Regulator Knob

3Ø-208V/1Ø-120V UVWO Terminal Output Voltages

1. Place the voltage selector switch in the 3Ø 240/139 position as shown in Figure 22.

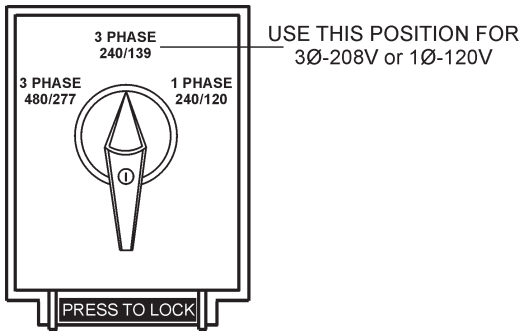


Figure 22. Voltage Selector Switch 3Ø-240/139V Position

2. Connect the load wires to the UVWO terminals as shown in Figure 23.

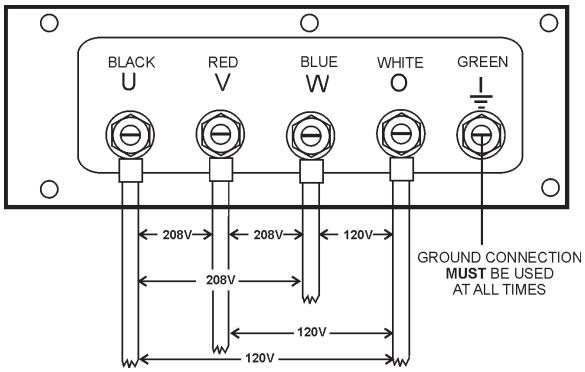


Figure 23. UVWO Terminal Lugs 3Ø-208/1Ø-120V Connections Connections

NOTICE

To achieve a 3Ø 208V output the voltage selector switch must be in the 3Ø-240/139 position and the voltage regulator must be adjusted to 208V..

3Ø-480/277V UVWO Terminal Output Voltages

1. Place the voltage selector switch in the 3Ø 480/277 position as shown in Figure 24.

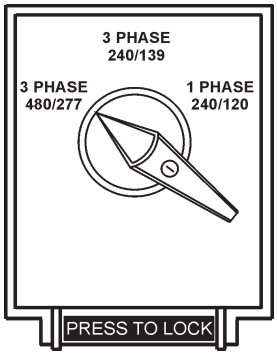


Figure 24. Voltage Selector Switch 3Ø-480/277V Position

2. Connect the load wires to the UVWO terminals as shown in Figure 25.

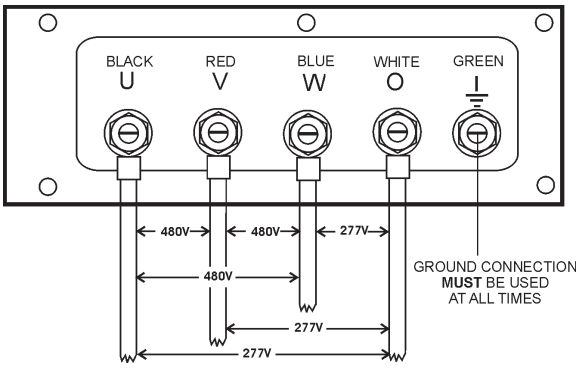


Figure 25. UVWO Terminal Lugs 3Ø-440/254V Connections

3. Turn the voltage regulator knob (Figure 21) clockwise to increase voltage output, turn counterclockwise to decrease voltage output. Use voltage regulator adjustment knob whenever fine tuning of the output voltage is required.

1Ø-240/120V UVWO Terminal Output Voltages

1. Place the voltage selector switch in the 1Ø 240/120 position as shown in Figure 26.

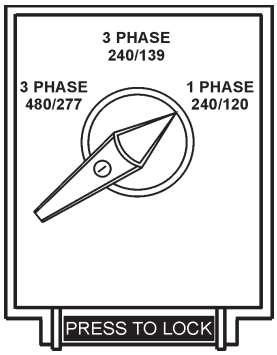


Figure 26. Voltage Selector Switch 1Ø-240/120V Position

2. Connect the load wires to the UVWO terminals as shown in Figure 27.

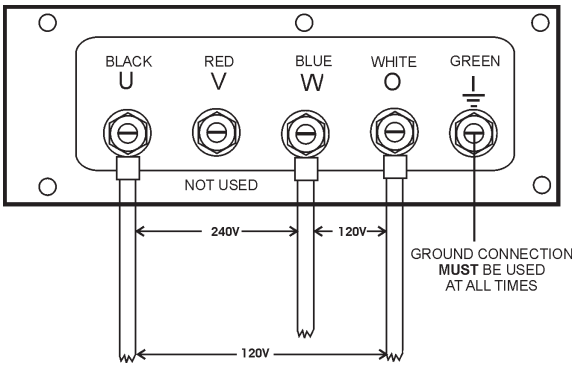


Figure 27. UVWO Terminal Lugs 1Ø-200/100V Connections

3. Turn the voltage regulator knob (Figure 21) clockwise to increase voltage output, turn counterclockwise to decrease voltage output. Use voltage regulator adjustment knob whenever fine tuning of the output voltage is required.

NOTICE

ALWAYS make sure that the connections to the UVWO terminals are **secure** and **tight**. The possibility of arcing exists, that could cause a fire.

CIRCUIT BREAKERS

To protect the generator from an overload, a 3-pole, 175 amp, main circuit breaker is provided to protect the **U,V, and W Output Terminals** from overload. In addition two single-pole, 20 amp **GFCI** circuit breakers are provided to protect the GFCI receptacles from overload. Three 50 amp **load** circuit breakers have also been provided to protect the auxiliary receptacles from overload. Make sure to switch **ALL** circuit breakers to the **OFF** position prior to starting the engine.

LUBRICATION OIL

Fill the engine crankcase with lubricating oil through the filler hole, but **DO NOT** overfill. Make sure the generator is level and verify that the oil level is maintained between the two notches (Figure 28) on the dipstick. See Table 11 for proper selection of engine oil.

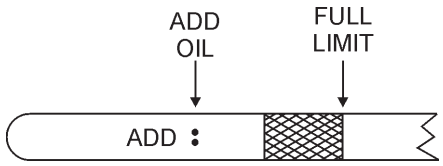


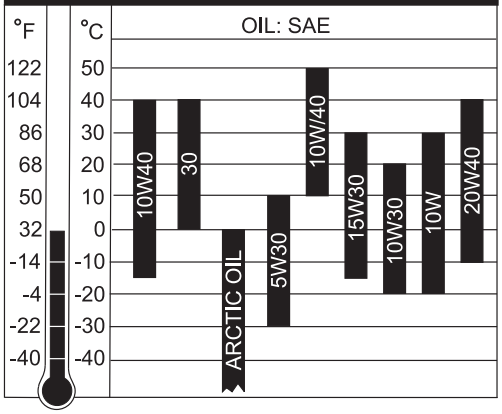
Figure 28. Engine Oil Dipstick

When checking the engine oil, be sure to check if the oil is clean. If the oil is not clean, drain the oil by removing the oil drain plug, and refill with the specified amount of oil as outlined in the **ISUZU Engine Owner's Manual**. Oil should be warm before draining.

Other types of motor oils may be substituted if they meet the following requirements:

- API Service Classification CC/SC
- API Service Classification CC/SD
- API Service Classification CC/SE
- API Service Classification CC/SF

Table 11. Recommended Motor Oil



FUEL CHECK

DANGER

Fuel spillage on a **hot** engine can cause a **fire** or **explosion**. If fuel spillage occurs, wipe up the spilled fuel completely to prevent fire hazards. **NEVER** smoke around or near the generator.

Refilling the Fuel System

CAUTION

ONLY properly trained personnel who have read and understand this section should refill the fuel tank system.

This generator has an internal fuel tank located inside the trailer frame and may also be equipped with an environmental fuel tank (Figure 29). **ALWAYS** fill the fuel tanks with clean fresh **#2 diesel fuel. DO NOT** fill the fuel tanks beyond their capacities.

Pay attention to the fuel tank capacity when replenishing fuel. The fuel tank cap must be closed tightly after filling. Handle fuel in a safety container. If the container does not have a spout, use a funnel. Wipe up any spilled fuel immediately.

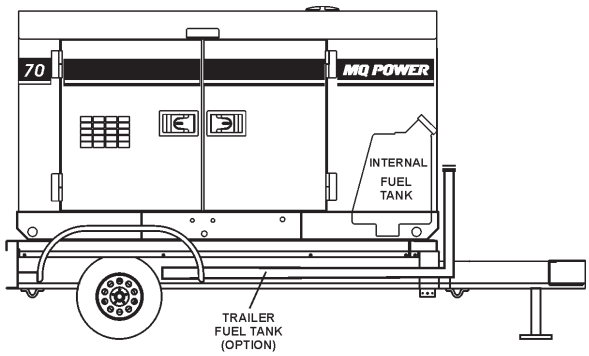


Figure 29. Internal Fuel Tank System

Refueling Procedure:

WARNING

Diesel fuel and its vapors are dangerous to your health and the surrounding environment. Avoid skin contact and/or inhaling fumes.

1. **Level Tanks** — Make sure fuel cells are level with the ground. Failure to do so will cause fuel to spill from the tank before reaching full capacity (Figure 30).

CAUTION

ALWAYS place trailer on firm level ground before refueling to prevent spilling and maximize the amount of fuel that can be pumped into the tank.

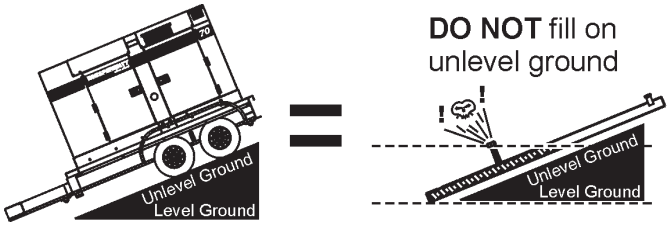


Figure 30. Only Fill on Level Ground

NOTICE

ONLY use **#2 diesel fuel** when refueling.

2. Open cabinet doors on the "right side" of the generator (from generator control panel position). Remove fuel cap and fill tank (Figure 31).

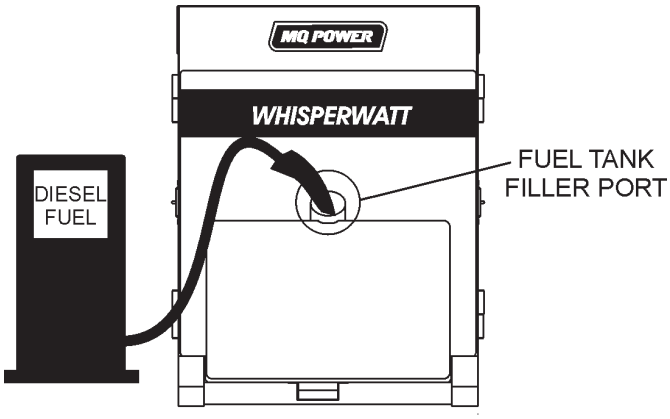


Figure 31. Fueling the Generator

3. **NEVER overfill fuel tank** — It is important to read the fuel gauge when filling trailer fuel tank. **DO NOT** wait for fuel to rise in filler neck (Figure 32).

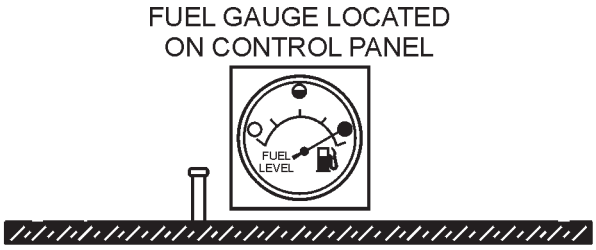


Figure 32. Full Fuel Tank

CAUTION

DO NOT OVERFILL fuel system. Leave room for fuel expansion. Fuel expands when heated (Figure 33).

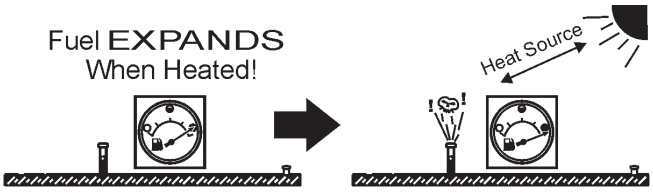


Figure 33. Fuel Expansion

COOLANT (ANTIFREEZE/SUMMER COOLANT/ WATER)

ISUZU recommends ISUZU antifreeze/summer coolant for use in their engines, which can be purchased in concentrate (and mixed with 50% demineralized water) or pre-diluted. See the **ISUZU Engine Owner's Manual** for further details.

⚠ WARNING

If adding coolant/antifreeze mix to the radiator, **DO NOT** remove the radiator cap until the unit has completely cooled. The possibility of **hot!** coolant exists which can cause severe burns.

Day-to-day addition of coolant is done from the recovery tank. When adding coolant to the radiator, **DO NOT** remove the radiator cap until the unit has completely cooled. See Table 12 for engine, radiator, and recovery tank coolant capacities. Make sure the coolant level in the recovery tank is always between the "H" and the "L" markings.

Table 12. Coolant Capacity

Engine and Radiator	3.09 gal (11.7 liters)
Reserve Tank	2 quarts (1.9 liters)

Operation in Freezing Weather

When operating in freezing weather, be certain the proper amount of antifreeze (Table 13) has been added.

Table 13. Anti-Freeze Operating Temperatures

Vol % Anti-Freeze	Freezing Point		Boiling Point	
	°C	°F	°C	°F
50	-37	-34	108	226

NOTICE

When the antifreeze is mixed with water, the antifreeze mixing ratio **must be** less than 50%.

CLEANING THE RADIATOR

The engine may overheat if the radiator fins become overloaded with dust or debris. Periodically clean the radiator fins with compressed air. Cleaning inside the machine is dangerous, so clean only with the engine turned off and the **negative** battery terminal disconnected.

AIR CLEANER

Periodic cleaning/replacement is necessary. Inspect it in accordance with the **ISUZU Engine Owner's Manual**.

FAN BELT TENSION

A slack fan belt may contribute to overheating, or to insufficient charging of the battery. Inspect the fan belt for damage and wear and adjust it in accordance with the **ISUZU Engine Owner's Manual.**

The fan belt tension is proper if the fan belt bends 10 to 15 mm (Figure 34) when depressed with the thumb as shown below.

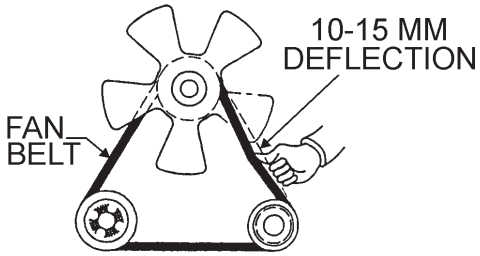


Figure 34. Fan Belt Tension

⚠ CAUTION

NEVER place hands near the belts or fan while the generator set is running.

BATTERY

This unit is of negative ground **DO NOT** connect in reverse. Always maintain battery fluid level between the specified marks. Battery life will be shortened, if the fluid level are not properly maintained. Add only distilled water when replenishment is necessary.

DO NOT over fill. Check to see whether the battery cables are loose. Poor contact may result in poor starting or malfunctions. **Always** keep the terminals firmly tightened. Coating the terminals with an approved battery terminal treatment compound. Replace battery with only recommended type battery.

The battery is sufficiently charged if the specific gravity of the battery fluid is 1.28 (at 68° F). If the specific gravity should fall to 1.245 or lower, it indicates that the battery is dead and needs to be recharged or replaced.

Before charging the battery with an external electric source, be sure to disconnect the battery cables.

Battery Cable Installation

ALWAYS be sure the battery cables (Figure 35) are properly connected to the battery terminals as shown below. The **red cable** is connected to the positive terminal of the battery, and the **black cable** is connected to the negative terminal of the battery.

⚠ CAUTION

ALWAYS disconnect the negative terminal **FIRST** and reconnect negative terminal **LAST**.

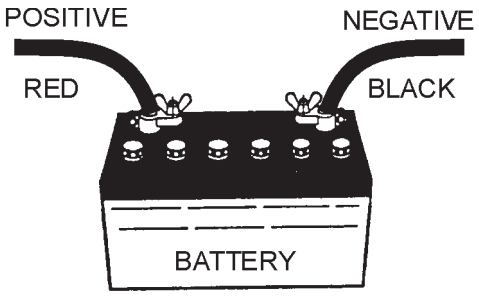


Figure 35. Battery Connections

When connecting battery do the following:

1. **NEVER** connect the battery cables to the battery terminals when the **MPEC Control Switch** is in either the **MANUAL** position. **ALWAYS** make sure that the **MPEC Control Switch** is in the **OFF/RESET** position when connecting the battery.
2. Place a small amount of battery terminal treatment compound around both battery terminals. This will ensure a good connection and will help prevent corrosion around the battery terminals.

NOTICE

If the battery cable is connected incorrectly, electrical damage to the generator will occur. Pay close attention to the polarity of the battery when connecting the battery.

⚠ CAUTION

Inadequate battery connections may cause poor starting of the generator, and create other malfunctions.

ALTERNATOR

The polarity of the alternator is negative grounding type. When an inverted circuit connection takes place, the circuit will be in short circuit instantaneously resulting the alternator failure.

DO NOT put water directly on the alternator. Entry of water into the alternator can cause corrosion and damage the alternator.

WIRING

Inspect the entire generator for bad or worn electrical wiring or connections. If any wiring or connections are exposed (insulation missing) replace wiring immediately.

PIPING AND HOSE CONNECTION

Inspect all piping, oil hose, and fuel hose connections for wear and tightness. Tighten all hose clamps and check hoses for leaks.

If any hose (**fuel or oil**) lines are defective replace them immediately.

BEFORE STARTING

⚠ CAUTION

The engine's exhaust contains harmful emissions. **ALWAYS have adequate ventilation when operating.** Direct exhaust away from nearby personnel.

⚠ WARNING

NEVER manually start the engine with the **main, GFCI or auxiliary** circuit breakers in the **ON** (closed) position.

1. Place the **main, G.F.C.I., and aux.** circuit breakers (**Figure 36**) in the **OFF** position prior to starting the engine.

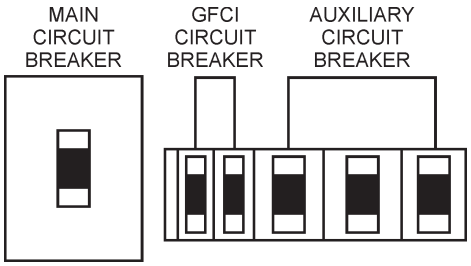


Figure 36. Main, Aux. and GFCI Circuit Breakers (OFF)

2. Make sure the **voltage change-over board** has been configured for the desired output voltage.
3. Connect the load to the **receptacles** or the **output terminal lugs** as shown in Figure 10. These load connection points can be found on the output terminal panel and the output terminal panel's hard wire hookup panel.
4. Tighten terminal nuts securely to prevent load wires from slipping out.
5. Close all engine enclosure doors (Figure 37).

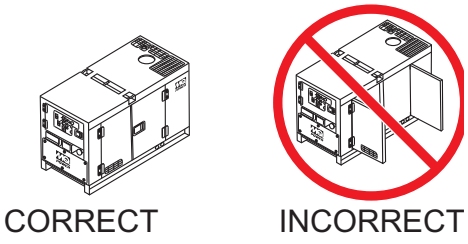


Figure 37. Engine Enclosure Doors

STARTING

1. Place the ***voltage selector switch*** in the desired voltage position (Figure 38)..

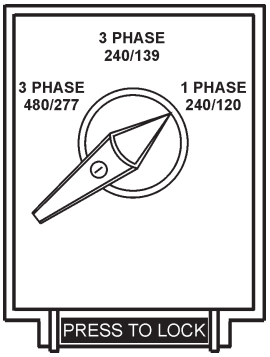


Figure 38. Voltage Selector Switch

STARTING (MANUAL)

1. Place the engine speed switch (Figure 39) in the LOW (down) position.

Figure 39. Engine Speed Switch (Low)

2. Place the **MPEC control switch** in the **MANUAL** position to start the engine (Figure 40).

Figure 40. MPEC Control Switch (Manual Position)

3. Depending on the temperature of the coolant (cold weather conditions), the pre-heat lamp (Figure 41) will light (ON) and remain on until the pre-heating cycle has been completed. After completion of the pre-heating cycle, the light will go OFF and the engine will start up automatically.

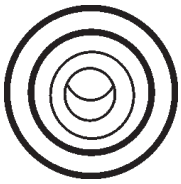


Figure 41. Pre-Heat Lamp

4. Once the engine starts, let the engine run for 1-2 minutes. Listen for any abnormal noises. If any abnormalities exist, shut down the engine and correct the problem. If the engine is running smoothly, place the engine speed switch (Figure 42) in the **HIGH** (up) position.

Figure 42. Engine Speed Switch (High)

5. Verify that the ***engine running*** status LED on the MPEC module (Figure 43) is lit (ON) after the engine has started.

Figure 43. Engine Running (LED ON)

6. The generator's frequency meter (Figure 44) should be displaying the 50 cycle output frequency in **HERTZ.**

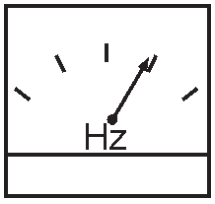


Figure 44. Frequency Meter

7. The generator's AC-voltmeter (Figure 45) will display the generator's output in **VOLTS**..

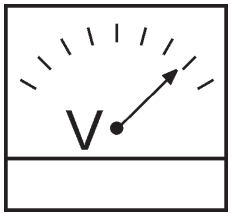


Figure 45. Frequency Meter

8. If the voltage is not within the specified tolerance use the voltage adjustment control knob (Figure 46) to increase or decrease the desired voltage.

Figure 46. Voltage Adjust Control Knob

9. The ammeter (Figure 47) will indicate **zero amps** with no load applied. When a load is applied, the ammeter will indicate the amount of current that the load is drawing from the generator.

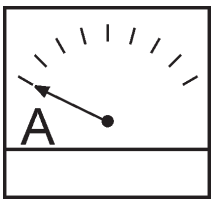


Figure 47. Ammeter (No Load)

10. The engine oil pressure gauge (Figure 48) will indicate the oil pressure of the engine. Under normal operating conditions the oil pressure is approximately 42 to 71 psi. (290~490 kPa).

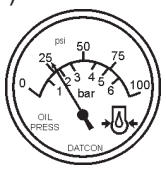


Figure 48. Oil Pressure Gauge

11. The **coolant temperature gauge** (Figure 49) will indicate the coolant temperature. Under normal operating conditions the coolant temperature should be between 167°~203°F (75°~95°C) (**Green Zone**).

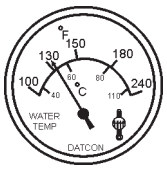


Figure 49. Coolant Temperature Gauge

12. The **tachometer gauge** (Figure 50) will indicate the speed of the engine when the generator is operating. Under normal operating conditions this speed is approximately 1800 RPM's.

Figure 50. Engine Tachometer Gauge

13. Place the **main, GFCI, and aux.** circuit breakers in the **ON** position (Figure 51).

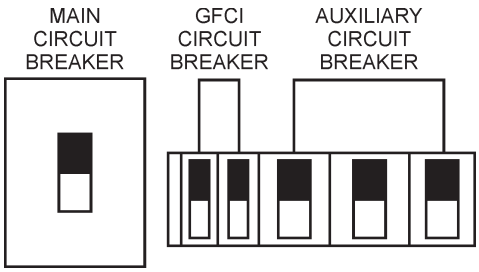


Figure 51. Main, Aux. and GFCI Circuit Breakers (ON)

14. Observe the generator's ammeter (Figure 52) and verify it reads the anticipated amount of current with respect to the load. The ammeter will only display a current reading if a load is in use.

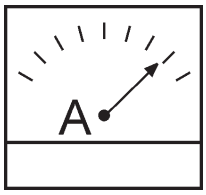


Figure 52. Ammeter (Load)

15. The generator will run until manually stopped or an abnormal condition occurs.

⚠ WARNING

NEVER stop the engine suddenly except in an emergency.

NORMAL SHUTDOWN PROCEDURE

To shutdown the generator, use the following procedure:

1. Place both the **MAIN, GFCI and LOAD** circuit breakers as shown in Figure 53 to the **OFF** position..

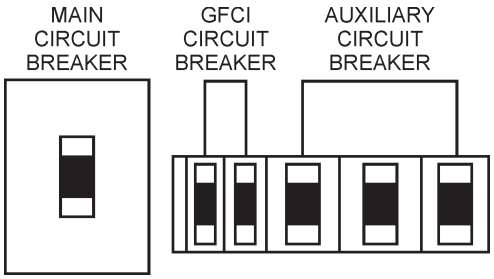


Figure 53. Main, GFCI and Load Circuit Breakers Off

2. Place the engine speed switch (Figure 54) in the "**LOW**" (down) position..

Figure 54. Ignition Switch (Normal)

3. Let the engine cool by running it at low speed for 3-5 minutes with no load applied.
4. Place the **MPEC Control Switch** (Figure 55) to the **OFF/RESET** position.

Figure 55. MPEC Control Switch (Off/Reset)

5. Verify that **all** status LEDs on the MPEC display are **OFF** (not lit).
6. Remove all loads from the generator.
7. Inspect entire generator for any damage or loosening of components that may have occurred during operation.

EMERGENCY SHUTDOWN PROCEDURE

1. Place the **MPEC Control Switch** (Figure 55) in the **OFF/RESET** position.

	Table 14. Inspection/Maintenance	10 Hrs DAILY	250 Hrs	500 Hrs	1000 Hrs
Engine	Check Engine Fluid Levels	X			
	Check Air Cleaner	X			
	Check Battery Acid Level	X			
	Check Fan Belt Condition	X			
	Check for Leaks	X			
	Check for Loosening of Parts	X			
	Replace Engine Oil and Filter * [1]		X		
	Clean Air Filter		X		
	Check Fuel Filter/Water Separator Bowl	X			
	Clean Unit, Inside and Outside		X		
	Change Fuel Filter			X	
	Clean Radiator and Check Coolant Protection Level*[2]			X	
	Replace Air Filter Element * [3]			X	
	Check all Hoses and Clamps * [4]				X
	Clean Inside of Fuel Tank				X
Generator	Measure Insulation Resistance Over 3M ohms		X		
	Check Rotor Rear Support Bearing			X	

*1 Replace engine oil and filter at 100 hours, first time only.

*2 Add "Supplemental Coolant Additives (SCA'S)" to recharge the engine coolant.

*3 Replace primary air filter element when restriction indicator shows a vacuum of 625 mm (25 in. H20).

*4 If blowby hose needs to be replaced, ensure that the slope of the blowby hose is at least a 1/2 inch per foot, with no sags or dips that could collect moisture and/or oil.

GENERAL INSPECTION

Prior to each use, the generator should be cleaned and inspected for deficiencies. Check for loose, missing or damaged nuts, bolts or other fasteners. Also check for fuel, oil, and coolant leaks. Use Table 14 as a general maintenance guideline **Engine Side** (Refer to the Engine Instruction Manual)

AIR CLEANER

Every 250 hours: Remove air cleaner element (Figure 56) and clean the heavy duty paper element with light spray of compressed air. Replace the air cleaner as needed.

Air Cleaner with Dust Indicator

This indicator (Figure 56) is attached to the air cleaner. When the air cleaner element is clogged, air intake restriction becomes greater and the dust indicator signal shows **RED** meaning the element needs changing or service. After changing the air element, press the dust indicator button to reset the indicator.

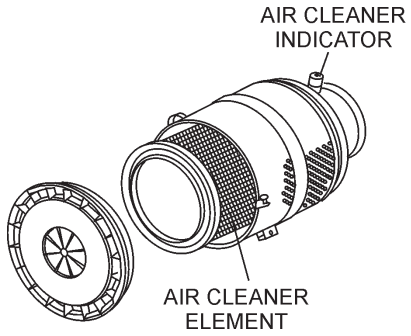


Figure 56. Air Cleaner/Indicator

NOTICE

The air filter should not be changed until the indicator reads **"RED"**. Dispose of old air filter. It may not be cleaned or reused.

If the engine is operating in very **dusty** or **dry grass** conditions, a clogged air cleaner will result. This can lead to a loss of power, excessive carbon buildup in the combustion chamber and high fuel consumption. Change air cleaner more **frequently** if these conditions exists.

FUEL ADDITION

Add diesel fuel (the grade may vary according to season and locations).

Removing Water from the Fuel Tank

After prolonged use, water and other impurities accumulate in the bottom of the tank. Occasionally inspect the fuel tank for water contamination and drain the contents if required.

During cold weather, the more empty volume inside the tank, the easier it is for water to condense. This can be reduced by keeping the tank full with diesel fuel.

Cleaning Inside the Fuel Tank

If necessary, drain the fuel inside the fuel tank completely. Using a spray washer (Figure 57) wash out any deposits or debris that have accumulated inside the fuel tank.

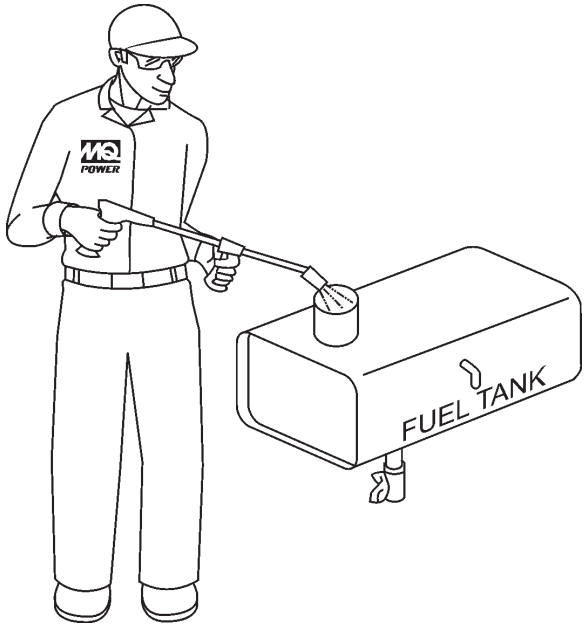


Figure 57. Fuel Tank Cleaning

FUEL TANK INSPECTION

In addition to cleaning the fuel tank, the following components should be inspected for wear:

- **Rubber Suspension** — look for signs of wear or deformity due to contact with oil. Replace the rubber suspension if necessary.
- **Fuel Hoses** — inspect nylon and rubber hoses for signs of wear, deterioration and hardening.
- **Fuel Tank Lining** — inspect the fuel tank lining for signs of excessive amounts of oil or other foreign matter.

Replacing Fuel Filter

- Replace the fuel filter cartridge with new one every 500 hours or so.
- Loosen the drain plug at the lower top of the fuel filter. Drain the fuel in the fuel body together with the mixed water. **DO NOT** spill the fuel during disassembly.
- Vent any air

AIR REMOVAL

If air enters the fuel injection system of a diesel engine, starting becomes impossible. After running out of fuel, or after disassembling the fuel system, bleed the system according to the following procedure. See the **ISUZU Engine Manual** for details.

To restart after running out of fuel, turn the switch to the “ON” position for 15-30 seconds. Try again, if needed.

CHECK OIL LEVEL

Check the crankcase oil level prior to each use, or when the fuel tank is filled. Insufficient oil may cause severe damage to the engine. Make sure the generator is level. The oil level must be between the two notches on the dipstick as shown in Figure 28.

Replacing Oil Filter

- Remove the old oil filter.
- Apply a film of oil to the gasket on the new oil filter.
- Install the new oil filter.
- After the oil cartridge has been replaced, the engine oil will drop slightly. Run the engine for a while and check for leaks before adding more oil if needed. Clean excessive oil from engine.

FLUSHING OUT RADIATOR AND REPLACING COOLANT

- Open both cocks located at the crankcase side and at the lower part of the radiator and drain coolant. Open the radiator cap while draining. Remove the overflow tank and drain.
- Check hoses for softening and kinks. Check clamps for signs of leakage.
- Tighten both cocks and replace the overflow tank.
- Replace with coolant as recommended by the engine manufacturer.
- Close radiator cap tightly.
- Flush the radiator by running clean tap water through radiator until signs of rust and dirt are removed. **DO NOT** clean radiator core with any objects, such as a screwdriver.

⚠ WARNING

Allow engine to **cool** when flushing out radiator. Flushing the radiator while hot could cause serious burns from water or steam.

RADIATOR CLEANING

The radiator (Figure 58) should be sprayed (cleaned) with a high pressure washer when excessive amounts of dirt and debris have accumulated on the cooling fins or tube. When using a high pressure washer, stand at least 5 feet (1.5 meters) away from the radiator to prevent damage to the fins and tube.

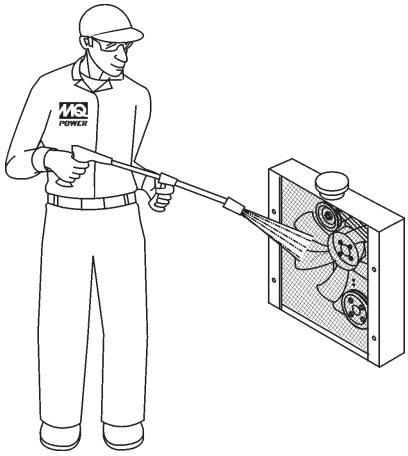


Figure 58. Radiator Cleaning

GENERATOR STORAGE

For long term storage of the generator the following is recommended:

- Drain the fuel tank completely. Treat with a fuel stabilizer if necessary.
- Completely drain the oil from the crankcase and refill if necessary with fresh oil.
- Clean the entire generator, internal and external.
- Cover the generating set and store in a clean, dry place.
- Disconnect the battery.
- Make sure engine coolant is at proper level.
- If generator is mounted on a trailer, jack trailer up and place on blocks so tires do not touch the ground or block and completely remove the tires.

TRAILER MAINTENANCE

This section is intended to provide the user with generic trailer service and maintenance information. The service and maintenance guidelines referenced in this section refer to a wide range of trailers.

Remember periodic inspection of the trailer will ensure safe towing of the generator and will prevent personal injury and damage to the equipment.

The definitions below describe some of the major components of a typical trailer that would be used with generator.

1. **Fuel Cell** — Provides an adequate amount of fuel for the equipment in use. Fuel cells must be empty when transporting equipment.
2. **Braking System** — System employed in stopping the trailer. Typical braking systems are electric, surge, hydraulic, hydraulic-surge and air.
3. **GVWR** — Gross Vehicle Weight Rating (GVWR) is the maximum number of pounds the trailer can carry, including the fuel cell (empty).
4. **Frame Length** — Measurement is from the ball hitch to the rear bumper (reflector).
5. **Frame Width** — Measurement is from fender to fender
6. **Jack Stand** — Trailer support device with maximum pound requirement from the tongue of the trailer.
7. **Coupler** — Type of hitch used on the trailer for towing.
8. **Tire Size** — Indicates the diameter of the tire in inches (10,12,14, etc.), and the width in millimeters (175,185,205, etc.). The tire diameter must match the diameter of the tire rim.
9. **Tire Ply** — The tire ply (layers) number is rated in letters; 2-ply,4-ply,6-ply, etc.
10. **Wheel Hub** — The wheel hub is connected to the trailer's axle.
11. **Tire Rim** — Tires mounted on a tire rim. The tire rim must match the size of the tire.
12. **Lug Nuts** — Used to secure the wheel to the wheel hub. Always use a torque wrench to tighten down the lug nuts. See Table 18 and Figure 61 for lug nut tightening and sequence.
13. **Axle** — Indicates the maximum weight the axle can support in pounds, and the diameter of the axle expressed in inches. Please note that some trailers have a double axle. This will be shown as 2-6000 lbs., meaning two axles with a total weight capacity of 6000 pounds.
14. **Suspension** — Protects the trailer chassis from shocks transmitted through the wheels. Types of suspension used are leaf, Q-flex, and air ride.
15. **Electrical** — Electrical connectors (looms) are provided with the trailer so the brake lights and turn signals can be connected to the towing vehicle.
16. **Application** — Indicates which units can be employed on a particular trailer.

BRAKES

Trailer brakes should be inspected the **first 200 miles** of operation. This will allow the brake shoes and drums to seat properly. After the first 200 mile interval, inspect the brakes **every 3,000 miles.** If driving over rough terrain, inspect the brakes more frequently.

Figure 59 displays the major hydraulic surge brake components that will require inspection and maintenance. Please inspect these components as required using steps 1 through 8 and Table 15 as listed below:

Brake Adjustment

1. Place the trailer on jack stands. Make sure the jack stands are placed on secure level ground.
2. Check the wheel and drum for free rotation.
3. Remove the adjusting hole cover from the adjusting slot at the bottom brake backing plate.
4. With a screwdriver or standard adjusting tool, rotate the star wheel of the adjuster assembly to expand the brake shoes.
5. Adjust the brake shoes outward until the pressure of the lining against the wheel drum makes the wheel difficult to turn.
6. Adjust, rotate the star wheel in the opposite direction until the wheel rotates freely with slight lining drag.
7. Replace the adjusting hole cover and lower the trailer to the ground.
8. Repeat steps 1 through 7 on the remaining brakes.

Hydraulic Surge Brakes

Hydraulic surge brakes (Figure 59) should not require any special attention with the exception of routine maintenance such as shoe and lining replacement. Brake lines should be periodically checked for cracks, kinks, or blockage.

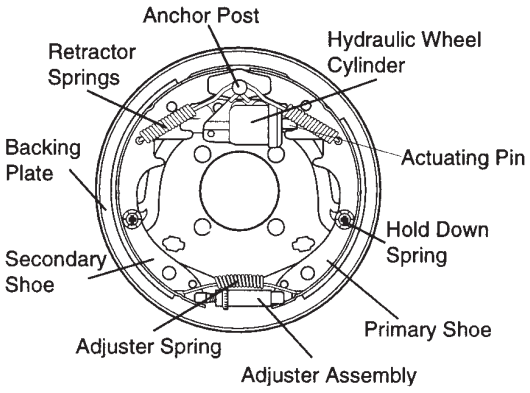


Figure 59. Hydraulic Brake Components

Actuator

Hydraulic surge braking requires the installation of an actuator at the tongue of the trailer. Remember the **surge or push** of the trailer toward the tow vehicle automatically synchronizes the trailer brakes with the tow vehicle brakes. As the trailer pushes against the tow vehicle the actuator telescopes together and applies force to the master cylinder, supplying hydraulic pressure to the trailer brakes.

Periodically check and test the surge "actuator" to make sure that it is functioning correctly. Never use an undersize actuator.

Table 15. Hydraulic Brake Troubleshooting

Symptom	Possible Cause	Solution
No Brakes	Brake line broken or kinked?	Repair or replace.
Weak Brakes or Brakes Pull to One Side	Brake lining glazed?	Reburnish or replace.
	Trailer overloaded?	Correct weight.
	Brake drums scored or grooved?	Machine or replace.
	Tire pressure correct?	Inflate all tires equally.
	Tires unmatched on the same axle?	Match tires.
Locking Brakes	Brake components loose, bent or broken?	Replace components.
	Brake drums out-of-round?	Replace.
Noisy Brakes	System lubricated?	Lubricate.
	Brake components correct?	Replace and correct.
Dragging Brakes	Brake lining thickness incorrect or not adjusted correctly?	Install new shoes and linings.
	Enough brake fluid or correct fluid?	Replace rubber parts fill with dot 4 fluid.

TIRES/WHEELS/LUG NUTS

Tires and wheels are a very important and critical components of the trailer. When specifying or replacing the trailer wheels it is important the wheels, tires, and axle are properly matched.

⚠ CAUTION

ALWAYS wear safety glasses when removing or installing force fitted parts. Failure to comply may result in serious injury.

⚠ CAUTION

DO NOT attempt to repair or modify a wheel. **DO NOT** install in inner tube to correct a leak through the rim. If the rim is cracked, the air pressure in the inner tube may cause pieces of the rim to explode (break off) with great force and cause serious eye or bodily injury.

Tire Wear/Inflation

Tire inflation pressure is the most important factor in tire life. Pressure should be checked cold before operation **DO NOT** bleed air from tires when they are **hot!**. Check inflation pressure weekly during use to insure the maximum tire life and tread wear.

Table 16 (Tire Wear Troubleshooting) will help pinpoint the causes and solutions of tire wear problems.

Table 16. Tire Wear Troubleshooting

Wear Pattern		Cause	Solution
	Center Wear	Over inflation.	Adjust pressure to particular load per tire manufacturer.
	Edge Wear	Under inflation.	Adjust pressure to particular load per tire manufacturer.
	Side Wear	Loss of camber or overloading.	Make sure load does not exceed axle rating. Align wheels.
	Toe Wear	Incorrect toe-in.	Align wheels.
	Cupping	Out-of-balance.	Check bearing adjustment and balance tires.
	Flat Spots	Wheel lockup and tire skidding.	Avoid sudden stops when possible and adjust brakes.

Suspension

The **leaf suspension** springs and associated components (Figure 60) should be visually inspected every 6,000 miles for signs of excessive wear, elongation of bolt holes, and loosening of fasteners. Replace all damaged parts (suspension) immediately. Torqued suspension components as detailed in Table 17.

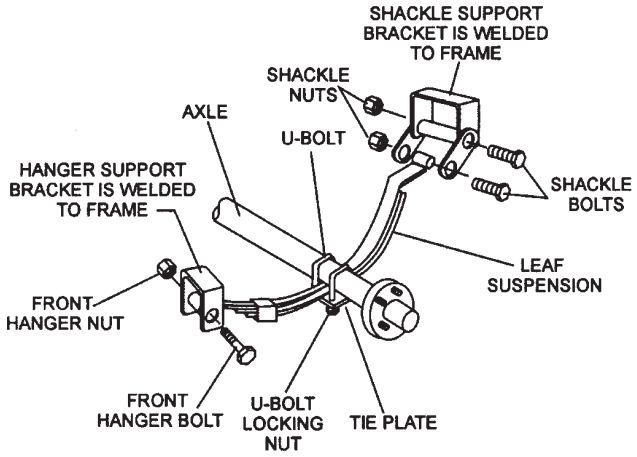


Figure 60. Major Suspension Components

Table 17. Suspension Torque Requirements

Item	Torque (Ft.-Lbs.)
3/8" U-Bolt	Min-30 Max-35
7/16" U-Bolt	Min-45 Max-60
1/2" U-Bolt	Min-45 Max-60
Shackle Bolt Spring Eye Bolt	Snug fit only. Parts must rotate freely. Locking nuts or cotter pins are provided to retain nut-bolt assembly.
Shoulder Type Shackle Bolt	Min-30 Max-50

Lug Nut Torque Requirements

It is extremely important to apply and maintain proper wheel mounting torque on the trailer. Be sure to use only the fasteners matched to the cone angle of the wheel. Proper procedure for attachment of the wheels is as follows:

1. Start all wheel lug nuts by hand.
2. Torque all lug nuts in sequence (see Figure 61). **DO NOT** torque the wheel lug nuts all the way down. Tighten each lug nut in 3 separate passes as defined by Table 18.
3. After first road use, retorque all lug nuts in sequence. Check all wheel lug nuts periodically.

Table 18. Tire Torque Requirements

Wheel Size	First Pass FT-LBS	Second Pass FT-LBS	Third Pass FT-LBS
12"	20-25	35-40	50-65
13"	20-25	35-40	50-65
14"	20-25	50-60	90-120
15"	20-25	50-60	90-120
16"	20-25	50-60	90-120

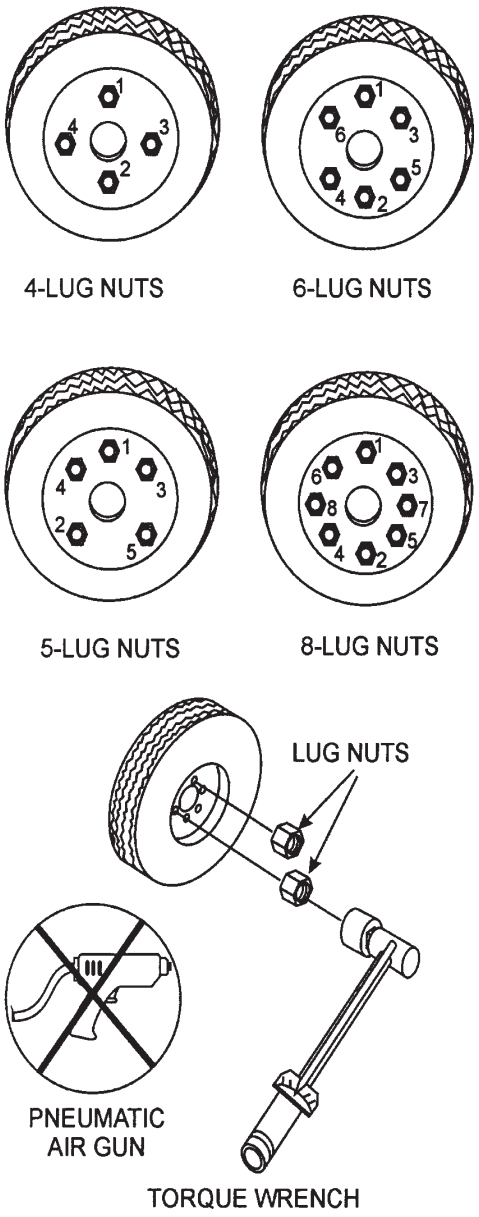


Figure 61. Wheel Lug Nuts Tightening Sequence

NOTICE

NEVER use an pneumatic air gun to tighten wheel lug nuts.

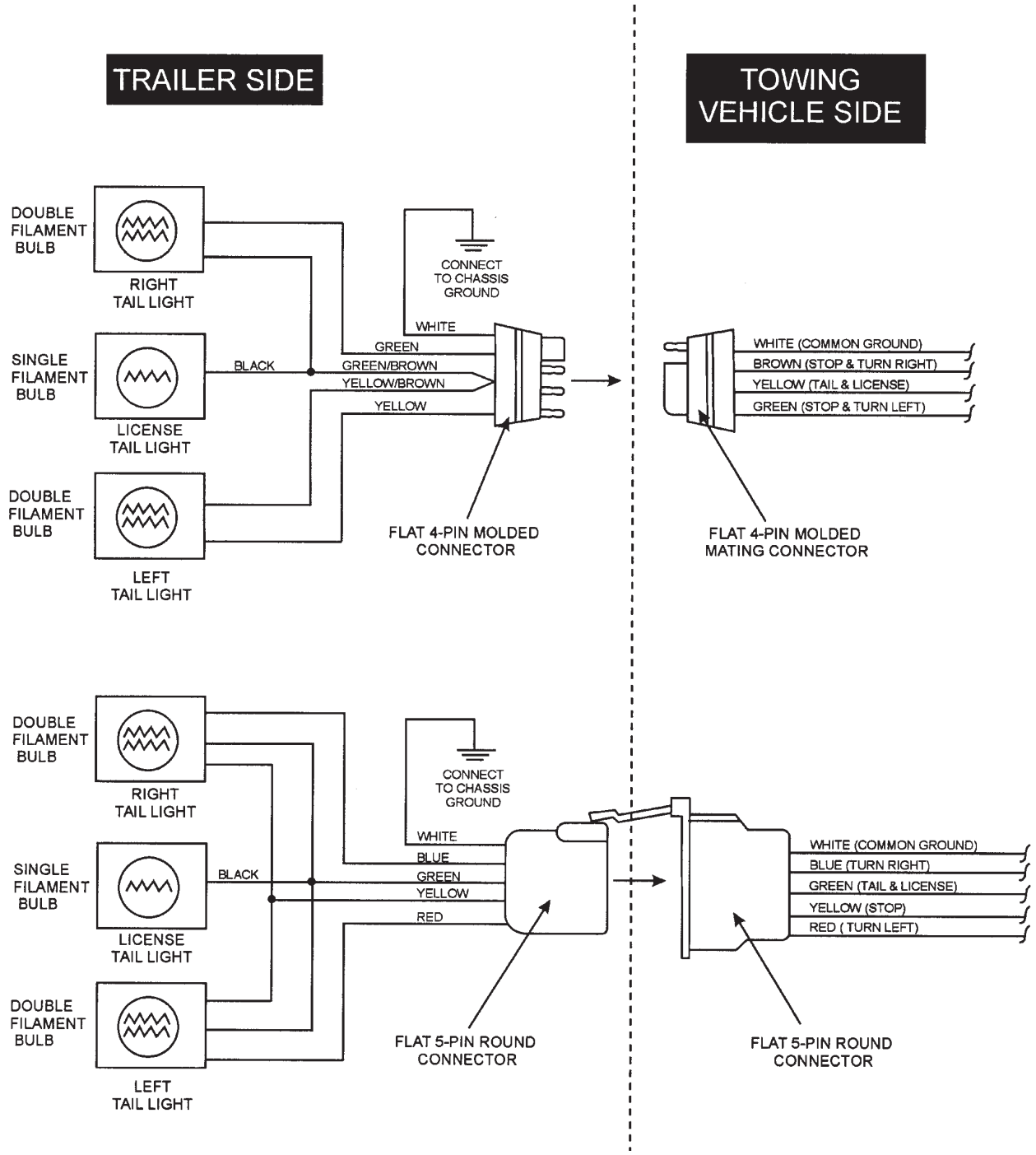
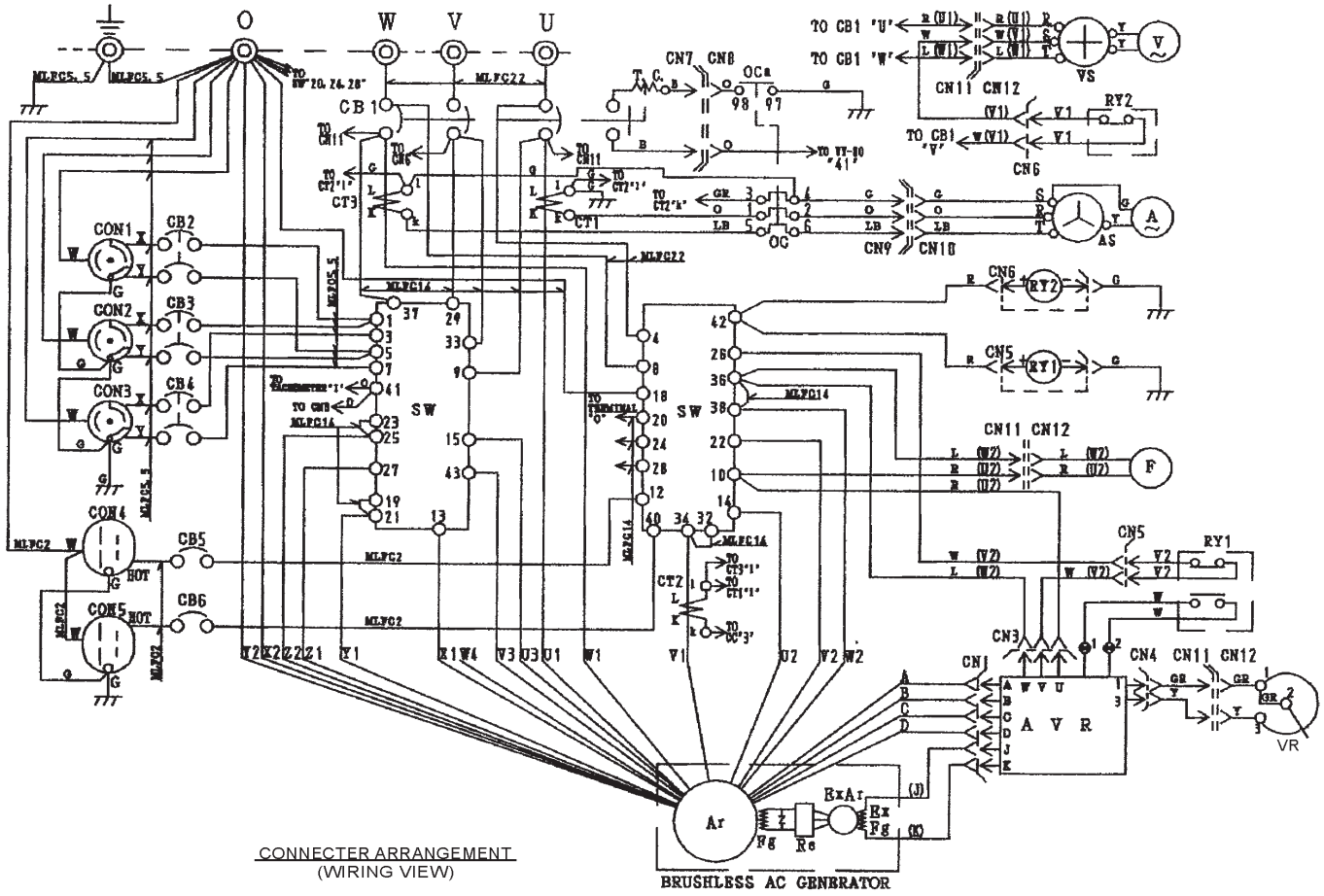
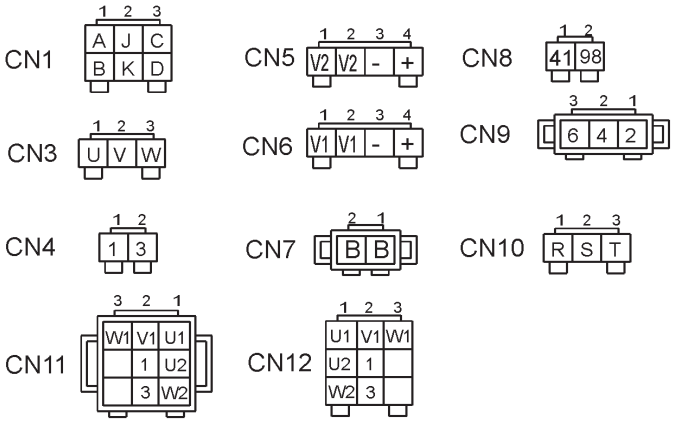


Figure 62. Trailer/Towing Vehicle Wiring Diagram





Notice :
1. No designation lead size : 1.25

SYMBOL	DESIGNATION
Ar	MAIN GENERATOR ARMATURE WINDING
Fg	MAIN GENERATOR FIELD WINDING
ExAr	EXCITER ARMATURE WINDING
ExFg	EXCITER FIELD WINDING
Re	RECTIFIER
AVR	AUTOMATIC VOLTAGE REGULATOR
VR	VOLTAGE REGULATOR (RHEOSTAT)
CT 1,2,3	CURRENT TRANSFORMER
AS	CHANGE-OVER SWITCH,AMMETER
A	AC.AMMETER
VS	CHANGE-OVER SWITCH,VOLTMETER
V	AC.VOLTMETER
F	FREQUENCY METER
CB1	CIRCUIT BREAKER 3P 110A
CB2,3,4	CIRCUIT BREAKER 2P 50A
CB5,6	CIRCUIT BREAKER 1P 20A
CON1,2,3	RECEPTACLE 250V 50A
CON5,6	RECEPTACLE 125V 20A
OC	OVER CURRENT RELAY
SW	SELECTOR SWITCH
RY1,2	RELAY UNIT
Re1	RELAY RECTIFIER

COLOR CODE			
SYM.	WIRE COLOR	SYM.	WIRE COLOR
B	BLACK	R	RED
L	BLUE	W	WHITE
BR	BROWN	Y	YELLOW
G	GREEN	LB	LIGHT BLUE
GR	GRAY	LG	LIGHT GREEN
V	VIOLET	O	ORANGE
P	PINK		

Figure 63. Generator Wiring Diagram

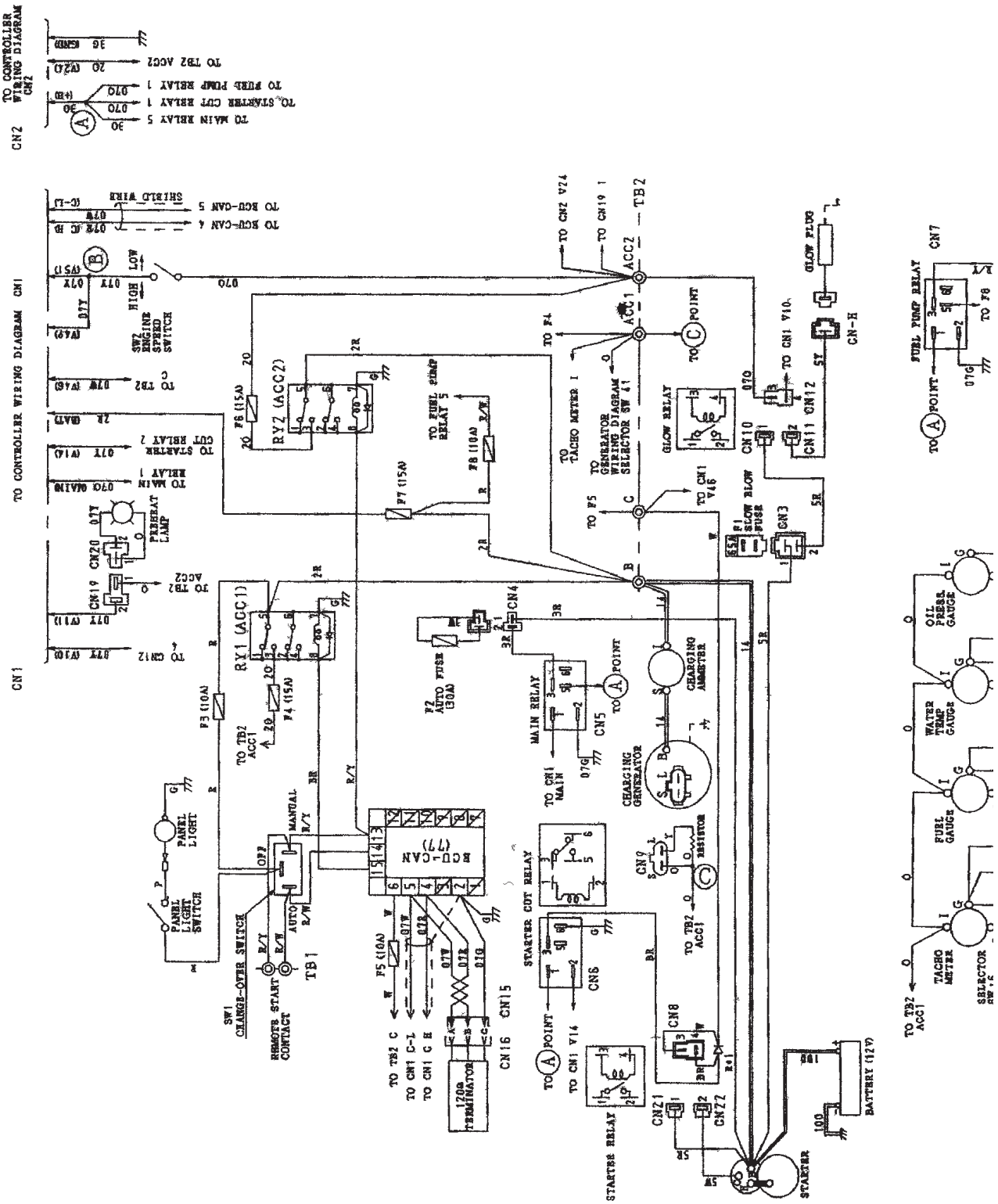


Figure 64. Engine Wiring Diagram

Practically all breakdowns can be prevented by proper handling and maintenance inspections, but in the event of a breakdown, use Table 17 shown below for diagnosis of the Generator. If the problem cannot be remedied, consult our company's business office or service plant.

Table 19. Generator Troubleshooting

Symptom	Possible Problem	Solution
No Voltage Output	AC Voltmeter defective?	Check output voltage using a voltmeter.
	Is wiring connection loose?	Check wiring and repair.
	Is AVR defective?	Replace if necessary.
	Defective Rotating Rectifier?	Check and replace.
	Defective Exciter Field?	Check for approximately 17.3 ohms across J & K on CN1
Low Voltage Output	Is engine speed correct?	Turn engine throttle lever to "High".
	Is wiring connections loose?	Check wiring and repair.
	Defective AVR?	Replace if necessary.
High Voltage Output	Is wiring connections loose?	Check wiring and repair.
	Defective AVR?	Replace if necessary.
Circuit Breaker Tripped	Short Circuit in load?	Check load and repair.
	Over current?	Confirm load requirements and reduce.
	Defective circuit breaker?	Check and replace.
	Over current Relay actuated?	Confirm load requirement and replace.

The engine controller of this generator diagnoses problems that arise from the engine control system and the engine itself. Press the diagnostic button (Figure 65) on the diagnostic panel to determine if an engine malfunction has occurred.

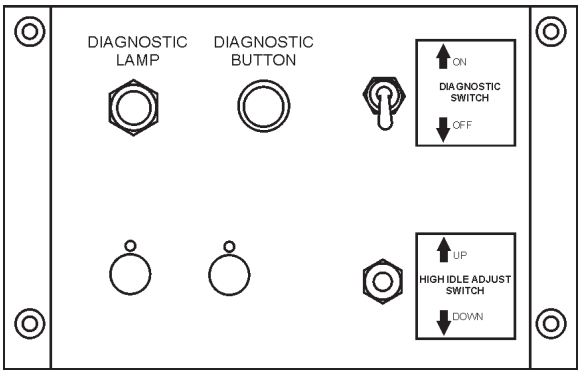


Figure 65. Diagnostic Panel

METHOD OF OPERATION

1. Normally, the diagnostic lamp will be **dimly** lit when the **MPEC Control Switch** is placed in the **MANUAL** position.
2. If engine trouble occurs, the diagnostic lamp will be **brightly** lit as long as the control switch is left in the manual position.
3. The diagnostic lamp will indicate that an engine malfunction has occurred.

NOTICE

For a complete understanding of error codes and troubleshooting procedures, refer to the enclosed engine instruction manual.

NOTICE

If the engine is cranked while the diagnostic switch is in the “ON” position, the engine will not be stopped even if the starter switch is turned to the “OFF” position. In such case, turn the diagnostic switch to the “OFF” position.

EXPLANATION OF CODE IN REMARKS COLUMN

The following section explains the different symbols and remarks used in the Parts section of this manual. Use the help numbers found on the back page of the manual if there are any questions.

NOTICE

The contents and part numbers listed in the parts section are subject to change **without notice**. Multiquip does not guarantee the availability of the parts listed.

SAMPLE PARTS LIST

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	12345	BOLT	1	INCLUDES ITEMS W/%
2%		WASHER, 1/4 IN		NOT SOLD SEPARATELY
2%	12347	WASHER, 3/8 IN	1	MQ-45T ONLY
3	12348	HOSE	A/R	MAKE LOCALLY
4	12349	BEARING	1	S/N 2345B AND ABOVE

NO. Column

Unique Symbols — All items with same unique symbol

(@, #, +, %, or >) in the number column belong to the same assembly or kit, which is indicated by a note in the "Remarks" column.

Duplicate Item Numbers — Duplicate numbers indicate multiple part numbers, which are in effect for the same general item, such as different size saw blade guards in use or a part that has been updated on newer versions of the same machine.

NOTICE

When ordering a part that has more than one item number listed, check the remarks column for help in determining the proper part to order.

PART NO. Column

Numbers Used — Part numbers can be indicated by a number, a blank entry, or TBD.

TBD (To Be Determined) is generally used to show a part that has not been assigned a formal part number at the time of publication.

A blank entry generally indicates that the item is not sold separately or is not sold by Multiquip. Other entries will be clarified in the "Remarks" Column.

QTY. Column

Numbers Used — Item quantity can be indicated by a number, a blank entry, or A/R.

A/R (As Required) is generally used for hoses or other parts that are sold in bulk and cut to length.

A blank entry generally indicates that the item is not sold separately. Other entries will be clarified in the "Remarks" Column.

REMARKS Column

Some of the most common notes found in the "Remarks" Column are listed below. Other additional notes needed to describe the item can also be shown.

Assembly/Kit — All items on the parts list with the same unique symbol will be included when this item is purchased.

Indicated by:

"INCLUDES ITEMS W/(unique symbol)"

Serial Number Break — Used to list an effective serial number range where a particular part is used.

Indicated by:

"S/N XXXXX AND BELOW"
"S/N XXXX AND ABOVE"
"S/N XXXX TO S/N XXX"

Specific Model Number Use — Indicates that the part is used only with the specific model number or model number variant listed. It can also be used to show a part is NOT used on a specific model or model number variant.

Indicated by:

"XXXXX ONLY"
"NOT USED ON XXXX"

"Make/Obtain Locally" — Indicates that the part can be purchased at any hardware shop or made out of available items. Examples include battery cables, shims, and certain washers and nuts.

"Not Sold Separately" — Indicates that an item cannot be purchased as a separate item and is either part of an assembly/kit that can be purchased, or is not available for sale through Multiquip.

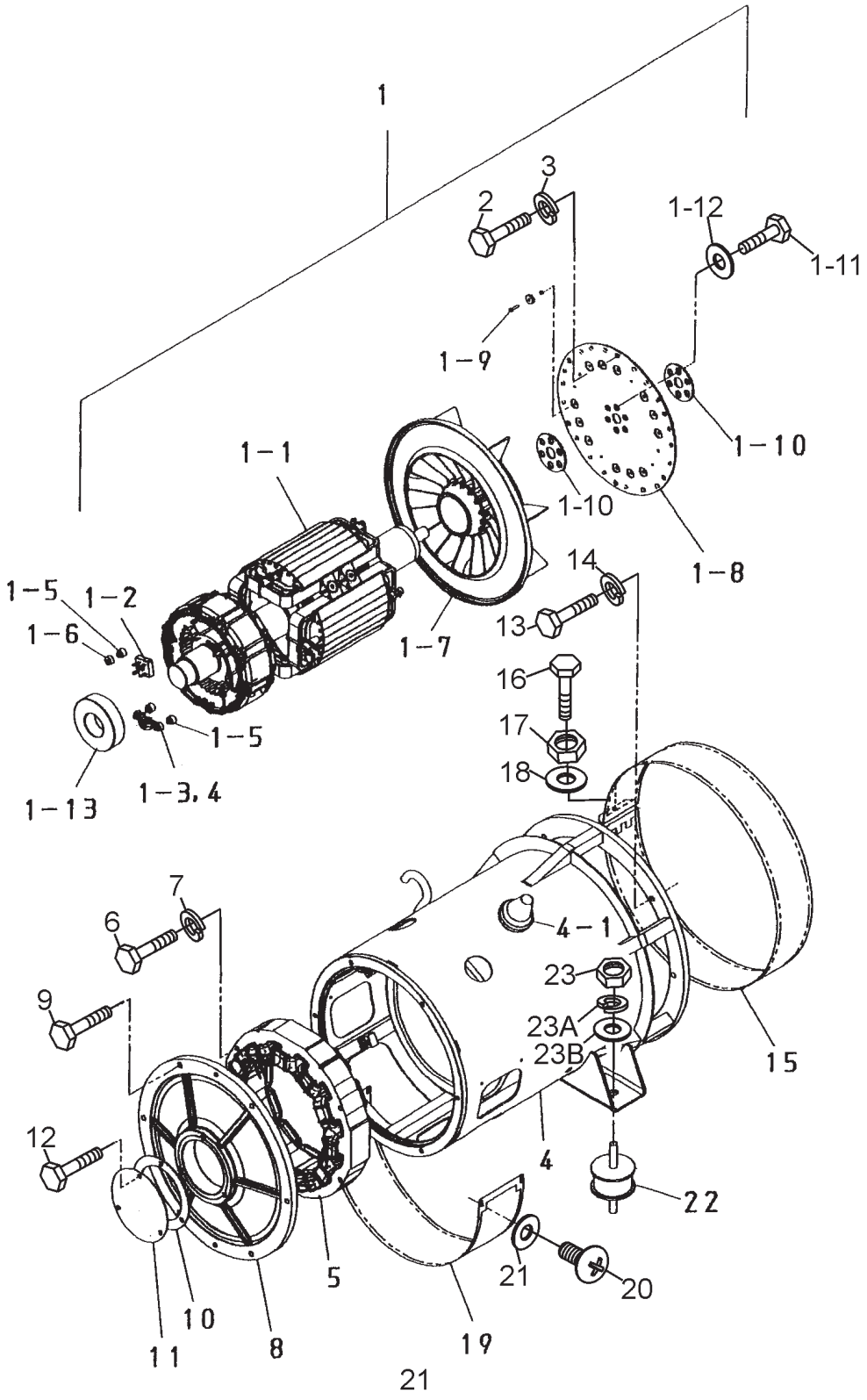
DCA70SSIU2 WHISPERWATT GENERATOR WITH ISUZU BJ-4JJ1X DIESEL ENGINE

1 to 3 units

QTY.	P/N	DESCRIPTION
5	8980188580	CARTRIDGE , OIL FILTER
5	8980088400	FILTER, FUEL, ELEMENT, MAIN
5	8980758540	FILTER, FUEL, ELEMENT, PRE
5	8980714010	FILTER, FUEL, FEED PUMP
3	0602046365	ELEMENT, AIR
1	8973629260	BELT, FAN
1	2310502003	RADIATOR HOSE, UPPER
1	2310502103	RADIATOR HOSE, LOWER
1	8121468300	SENSOR, WATER TEMP. (ENGINE SIDE)
1	8971256001	SWITCH, WARNING, OVERHEAT (ENGINE SIDE)
1	8980274560	SENSOR, OIL PRESSURE (ENGINE SIDE)
1	1096300850	GASKET, SENSOR OIL PRESSURE (ENGINE SIDE)
1	0601870440	CIRCUIT BREAKER, 1P, 20 AMP
1	0601870441	CIRCUIT BREAKER, 2P, 50 AMP
1	0601806644	FUSE, 30 AMP
1	0601806640	FUSE, 65 AMP
3	0601806671	FUSE, 15 AMP
1	0601820602	AUTOMATIC VOLTAGE REGULATOR
1	0602122272	UNIT, OIL PRESSURE
1	???????????	UNIT, WATER TEMPERATURE
1	???????????	SENDER, WATER SWITCH (ENGINE SIDE)
1	???????????	SENDER, OIL SWITCH (ENGINE SIDE)

NOTICE

Part number on this Suggested Spare Parts list may supersede/replace the P/N shown in the text pages of this book.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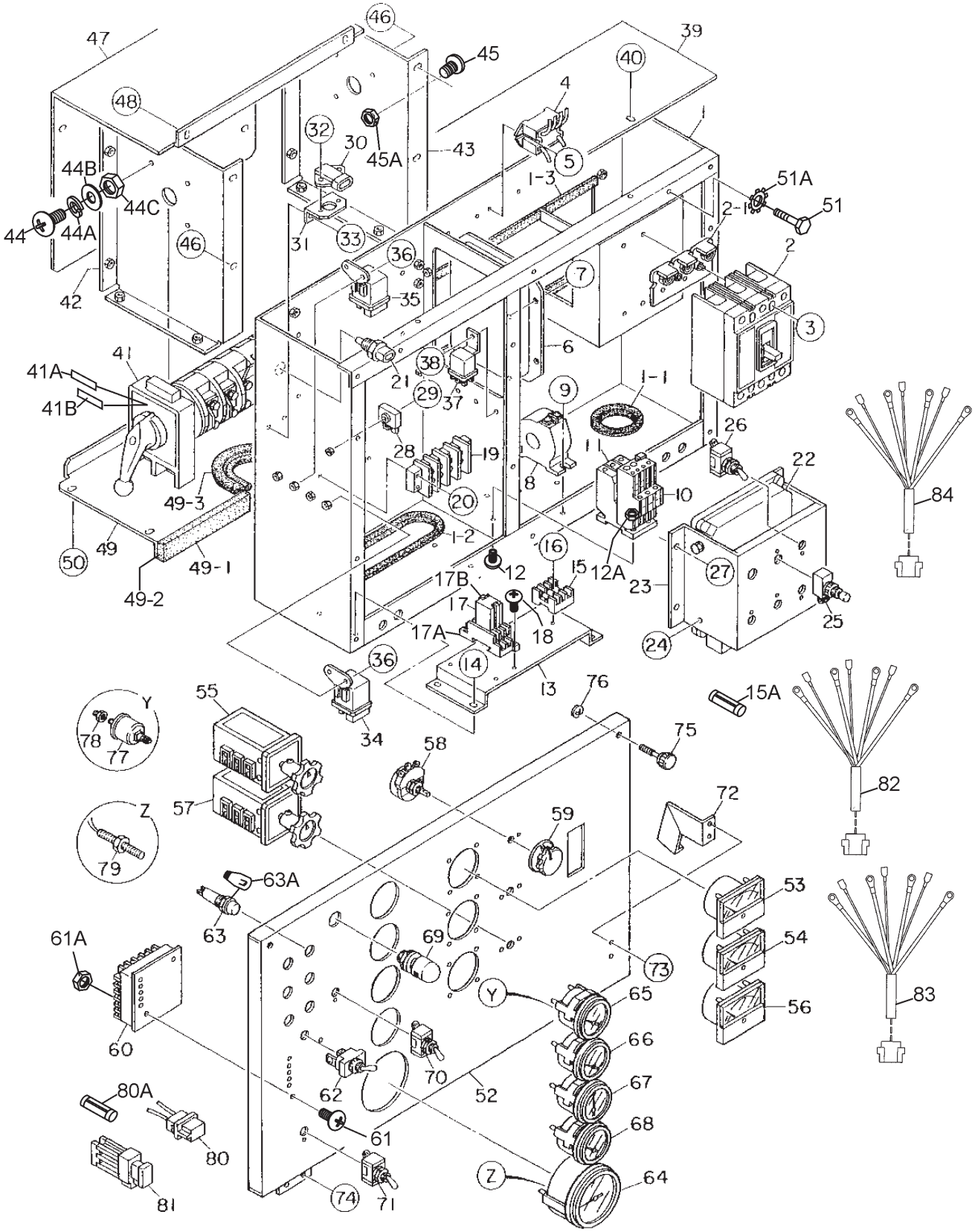
NO.	PART NO.	PART NAME	QTY.	REMARKS
1	B5110000402	ROTOR ASSY	1	
1-1		FIELD ASSY	1	
1-2	0601820083	RECTIFIER	3	
1-3	0601822664	ZNR	1	
1-4	B3120100804	HOLDER, ZNR	1	
1-5	B3120100604	INSULATOR WASHER	3	
1-6	B3120100604	INSULATOR WASHER	5	
1-7	B3111100603	FAN	1	
1-8	B2163100004	COUPLING DISK	3	PURCHASE ITEMS 1- THRU 1-9 AS A SET
1-9	0010304016	HEX HEAD BOLT		
1-9A	B2163700004	BALANCING WEIGHT		
1-9B	0204004000	U-NUT		
1-10	B3163200104	COUPLING WASHER	2	
1-11	0342612030	HEX HEAD CAP SCREW	6	
1-12	0046512000	WASHER, FLAT	6	
1-13	0071906309	BEARING	1	
2	0010310020	HEX HEAD BOLT	8	
3	0042510000	WASHER, LOCK	8	
4	B5130000303	STATOR ASSY	1	
4-1	0845041904	GROMMET	2	
5	B3137000803	FIELD ASSY EXCITER	1	
6	0016008060	HEX HEAD CAP SCREW	4	
7	0042508000	WASHER, LOCK	4	
8	B3153000513	END BRACKET	1	
9	0017108035	HEX HEAD BOLT	6	
10	B3153400504	PACKING	1	
11	B3153400404	COVER, BEARING	1	
12	0017106016	HEX HEAD BOLT	3	
13	0010310025	HEX HEAD BOLT	12	
14	0042510000	WASHER, LOCK	12	
15	B5131300004	COVER, END BRACKET	1	
16	0340406040	HEX HEAD BOLT	1	
17	0600815000	NUT	1	
18	0041206000	WASHER, FLAT	1	
19	B3131300804	COVER, END BRACKET	1	
20	0029205012	MACHINE SCREW	4	
21	0041205000	WASHER, FLAT	4	
22	0605000413	RUBBER SUSPENSION	2	
23	0030012000	HEX NUT	2	
23A	0040012000	WASHER, LOCK	2	
23B	0041212000	WASHER, FLAT	2	

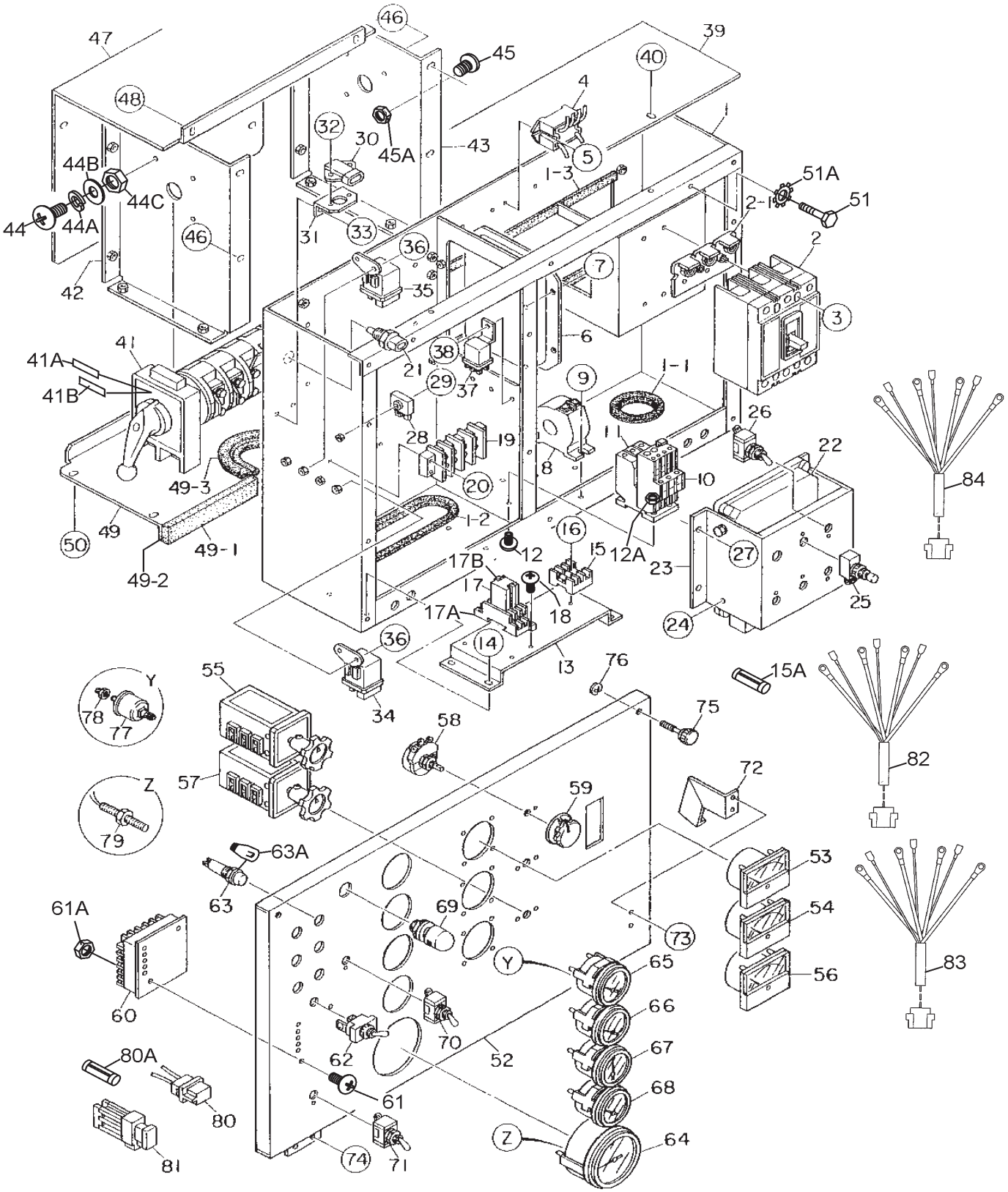
CONTROL BOX ASSY.



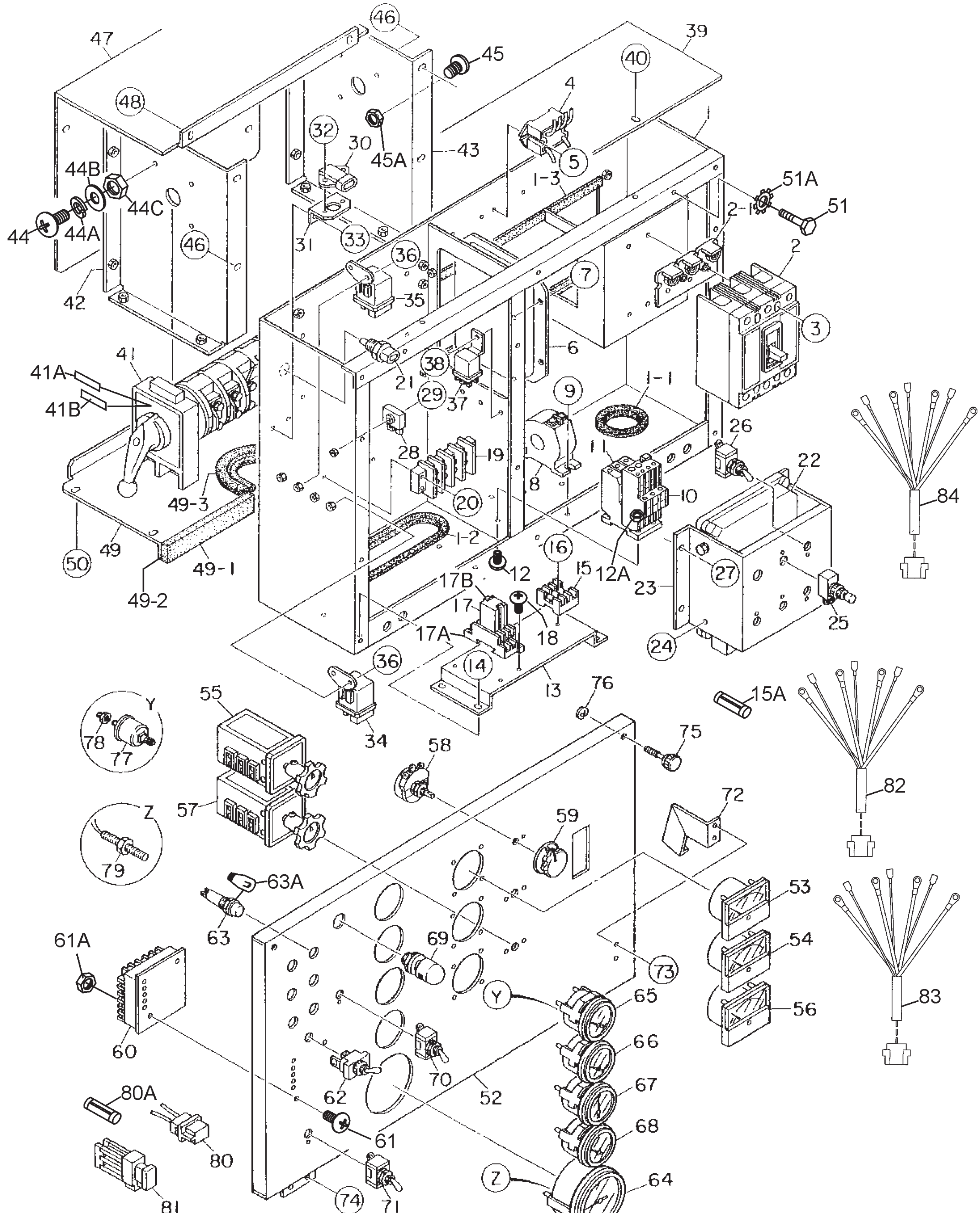
CONTROL BOX ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	M2213001602	CONTROL BOX	1	
1-1	0330000180	EDGING	2	
1-2	0330000615	EDGING	1	
1-3	0330000300	EDGING	2	
2	0601870432	CIRCUIT BREAKER, 175A	1	
2-1	0601870490	COVER, CIRCUIT BREAKER	2	
3	0021004040	MACHINE SCREW	4	
4	0601823863	RELAY UNIT	2	
5	0027104016	MACHINE SCREW	4	
6	0601820602	AUTOMATIC VOLTAGE REGULATOR	1	
7	0027105016	MACHINE SCREW	4	
8	0601801123	CURRENT TRANSFORMER	3	
9	0027106020	MACHINE SCREW	6	
10	0601820847	OVER CURRENT RELAY	1	
11	0601820848	OVER CURRENT RELAY	1	
12	0027104016	MACHINE SCREW	2	
12A	0207004000	HEX NUT	2	
13	M2260500204	SET PANEL, ELECTRIC PARTS	1	
14	0016906016	HEX HEAD BOLT	4	
15	0601802218	HOLDER, FUSE	1	
15A	0601806671	FUSE, 15A	3	
16	0027103020	MACHINE SCREW	1	
17	LY20DC12V	RELAY	2	REPLACES P/N 0601827656
17A	PTF08A	BASE	2	REPLACES P/N 0601823109
17B	PYCAT	CLIP	4	REPLACES P/N 0601824400
18	0027104020	MACHINE SCREW	4	
19	0601815153	TERMINAL	1	
20	0027104016	MACHINE SCREW	2	
21	8121468300	SENSOR, INLET AIR TEMP.	1	REPLACES P/N 0603210240
22	8980980660	CONTROLLER	1	REPLACES P/N 0602202689
23	M3260500604	BRACKET	1	
24	0016906016	HEX HEAD BOLT	4	
25	0601831205	PUSH BUTTON SWITCH	1	
26	0601831330	DIAGNOSTIC SWITCH	1	
27	0016916016	HEX HEAD BOLT	4	
28	0601823240	RECTIFIER	1	
29	0027105020	MACHINE SCREW	1	
30	8972177780	SENSOR, BAROMETRIC PRESSURE	1	REPLACES P/N 0602130220
31	M2260600104	BRACKET, SENSOR	1	
32	0027105016	MACHINE SCREW	2	
33	0027105016	MACHINE SCREW	2	
34	8942481610	RELAY, STARTER	1	REPLACES P/N 0602202502

CONTROL BOX ASSY.



NO.	PART NO.	PART NAME	QTY.	REMARKS
35	8970119490	RELAY, GLOW PLUG	1	REPLACES P/N 0602202685
36	0027105016	MACHINE SCREW	4	
37	5825500290	RELAY	3	REPLACES P/N 0602201400
38	0027105016	MACHINE SCREW	3	
39	M2213500704	CONTROL BOX COVER	1	
40	0016906016	HEX HEAD BOLT	4	
41	M2270100104	SECLECTOR SWITCH	1	
41A	M2550001604	DECAL : SELECTOR SWITCH NO.	1	
41B	M2550001704	DECAL : SELECTOR SWITCH NO.	1	
42	M2213602704	SWITCH BRACKET	1	
43	M2213602704	SWITCH BRACKET	4	
44	0021004040	MACHINE SCREW	4	
44A	0040004000	WASHER, LOCK	4	
44B	0041204000	WASHER, FLAT	4	
44C	0207004000	HEX NUT	4	
45	0027104016	MACHINE SCREW	4	
45A	0207004000	HEX NUT	4	
46	0016906016	HEX HEAD BOLT	4	
47	M2213602804	SWITCH COVER	1	
48	0016906016	HEX HEAD BOLT	6	
49	M2213602904	SWITCH COVER	1	
49-1	0228800165	SEAL RUBBER	1	
49-2	0228800115	SEAL RUBBER	1	
49-3	0317700180	SEAL RUBBER	1	
50	0016906016	HEX HEAD BOLT	4	
51	0016906016	HEX HEAD BOLT	12	
51A	0040506000	TOOTHED WASHER	1	
52	M2223001103	CONTROL PANEL	1	
53	0601807641	FREQUENCY METER, 45~ 65Hz 240V	1	
54	0601808987	AC AMMETER, 0~ 150A/300A : 5A	1	
55	0601801040	CHANGE- OVER SWITCH, AMMETER	1	
56	0601806859	AC VOLTMETER, 0~ 600V	1	
57	0601801041	CHANGE-OVER SWITCH, VOLTMETER	1	
58	0601840073	RHEOSTAT (VR), 2W 1K OHM	1	
59	0601840121	KNOB	1	
60	0602202641	CONTROLLER	1	
61	0021004040	MACHINE SCREW	2	
61A	0207004000	HEX NUT	2	
62	0601831340	SWITCH	1	
63	0602103092	ALARM LAMP	2	
63A	0601810245	BULB, DC18V	2	
64	0602120095	TACHOMETER	1	
65	0602122093	OIL PRESSURE GAUGE	1	
66	0602123090	WATER TEMPERATURE GAUGE	1	
67	0602121081	CHARGING AMMETER	1	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17B
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17A
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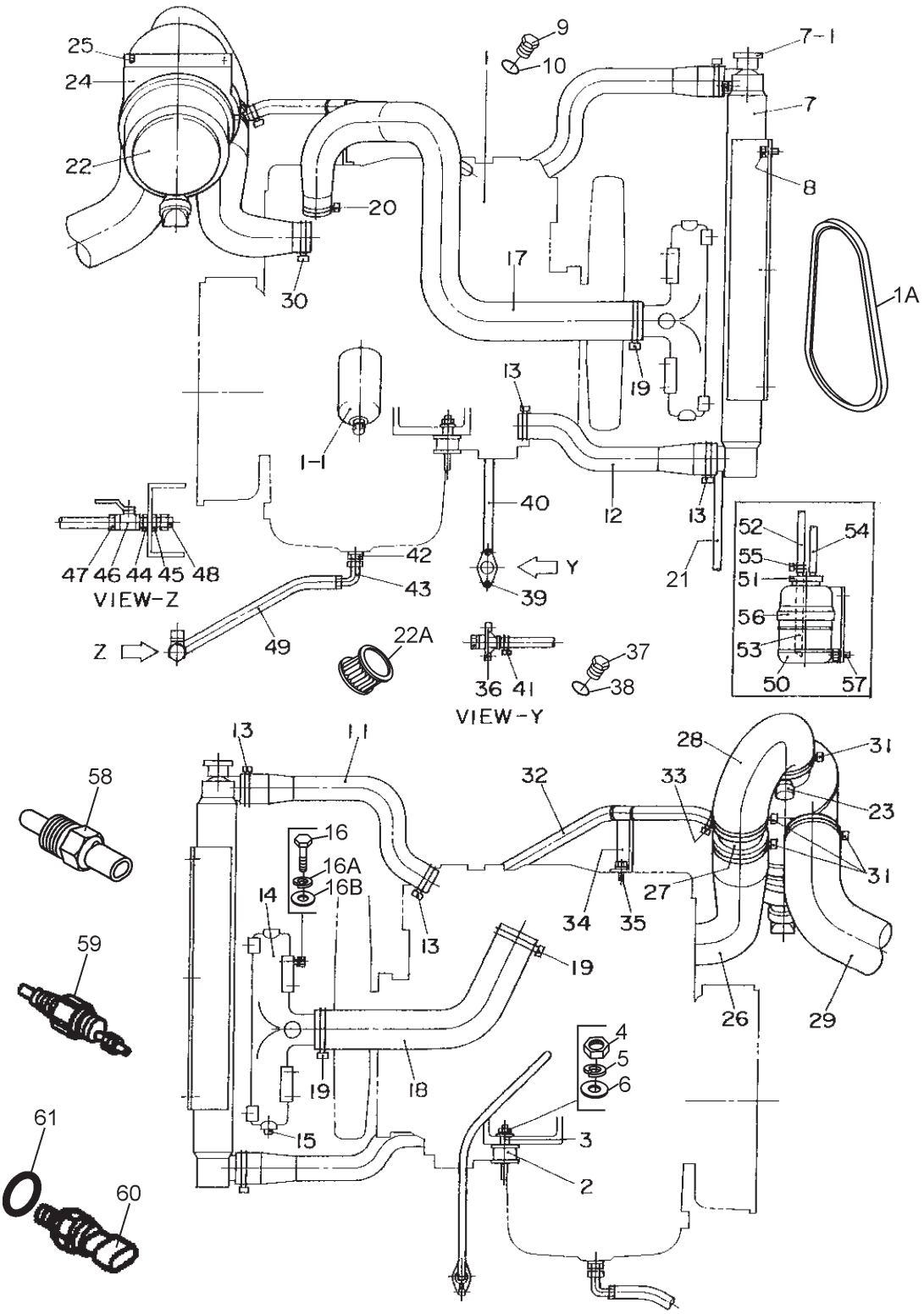
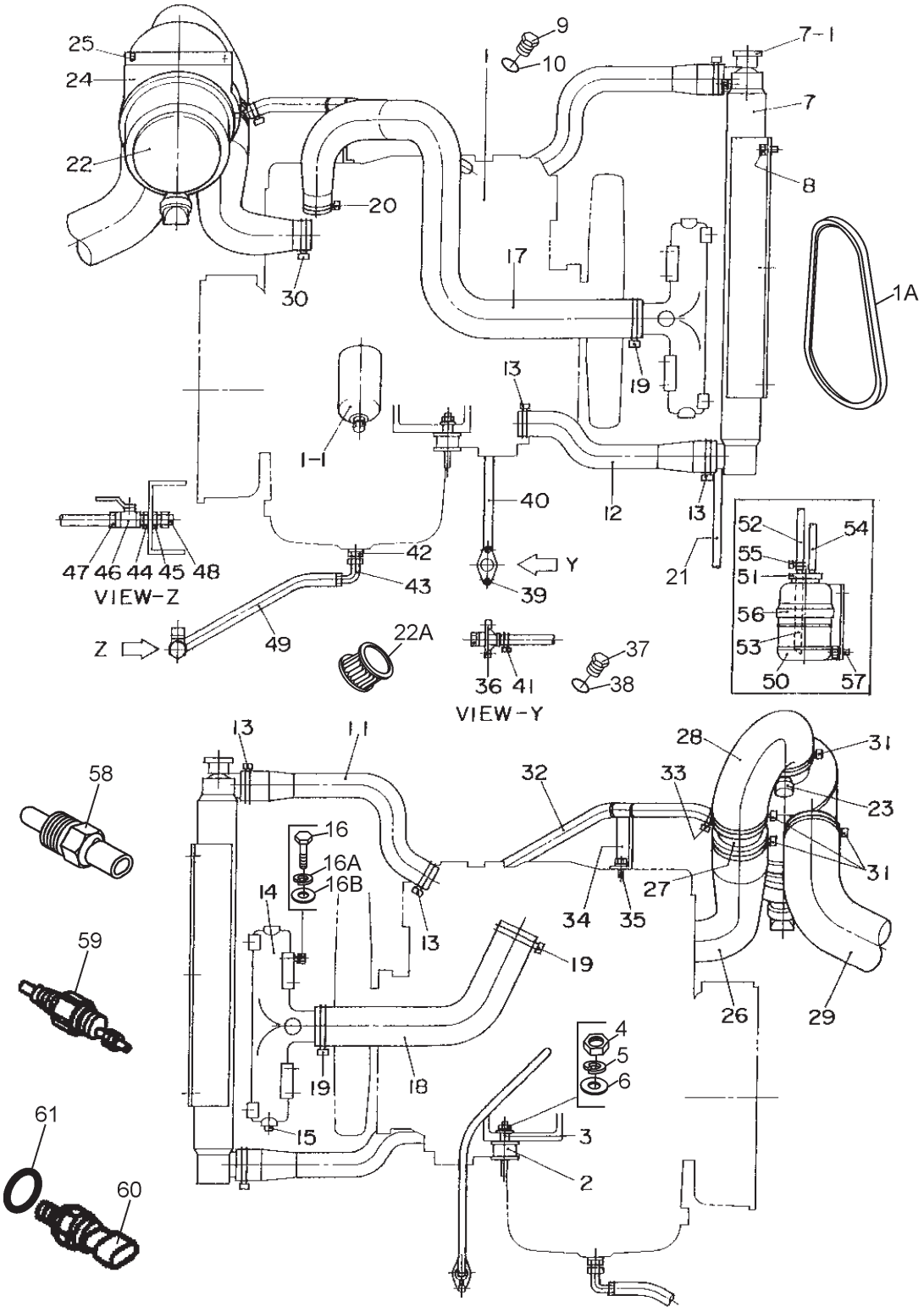
NO.	PART NO.	PART NAME	QTY.	REMARKS
68	0602125090	FUEL GAUGE	1	
69	0601810141	PANEL LIGHT	1	
70	0601831330	SWITCH, PANEL LIGHT	1	
71	0601831395	SWITCH, ENGINE SPEED	1	
72	M1224100104	STOPPER	1	
73	0027105010	MACHINE SCREW	2	
74	0027105010	MACHINE SCREW	4	
75	M9220100004	SET SCREW	2	
76	0080200007	SNAP RING	2	
77	0602122272	UNIT, OIL PRESSURE	1	
78	M9200100004	ADAPTER	1	
79	0602120465	PICK UP, TACHOMETER	1	
80	M2357202104	FUSE HOLDER UNIT	1	
80A	0601806644	FUSE, 30A	1	
81	0601806640	FUSE, 65A	1	
82	M2246702504	WIRE HARNESS, GENERATOR	1	
83	M2357202002	WIRE HARNESS, ENGINE	1	
84	M2357201802	WIRE HARNESS, CONTROLLER	1	

ENGINE AND RADIATOR ASSY.



ENGINE AND RADIATOR ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	M2923200144	ENGINE, ISUZU BJ-4JJ1X	1	
1A	8973629260	FAN BELT	1	REPLACES P/N 0602015256
1-1	8980188580	CARTRIDGE, OIL FILTER	1	REPLACES P/N 0602041222
2	0605000451	RUBBER SUSPENSION	2	
3	M2413800104	COLLER	2	
4	0030010000	HEX NUT	1	
5	0040010000	WASHER, LOCK	2	
6	0042810000	WASHER, FLAT	2	
7	M2923200074	RADIATOR	1	
7-1	0602011029	CAP, RADIATOR	1	
8	0016908020	HEX HEAD BOLT	6	
9	M9200100904	PLUG	1	
10	0150000016	O-RING	1	
11	M2310502003	RADIATOR HOSE, UPPER	1	
12	M2310502103	RADIATOR HOSE, LOWER	1	
13	0605515147	HOSE BAND	4	
14	M2923200124	INTER COOLER	1	
15	0132004000	PLUG, 3/8"	1	
16	0010510020	HEX HEAD BOLT	8	
16A	0040010000	WASHER, LOCK	8	
16B	0041210000	WASHER, FLAT	8	
17	M2310501903	INTER COOLER HOSE	1	
18	M2310501803	INTER COOLER HOSE	1	
19	0605515208	HOSE BAND	3	
20	0605515207	HOSE BAND	1	
21	0193601000	DRAIN HOSE	1	
22	0602046582	AIR CLEANER	1	
22A	0602046365	ELEMENT, AIR CLEANER	1	
23	0602040651	INDICATOR, AIR CLEANER	1	
24	0602040554	AIR CLEANER BAND	1	
25	0016908030	HEX HEAD BOLT	2	
26	M2373101603	HOSE, AIR CLEANER	1	
27	M2326100304	BLOWBY PIPE	1	
28	M2373101503	HOSE, AIR CLEANER	1	
29	M2373101403	HOSE, AIR CLEANER	1	
30	0605515230	HOSE BAND	1	
31	0605515197	HOSE BAND	4	
32	0191500770	BLOWBY HOSE	1	
33	0605515149	HOSE BAND	2	
34	M3326200204	BLOWBY HOSE BRACKET	1	
35	0016908020	HEX HEAD BOLT	1	
36	M2320300103	DRAIN JOINT	1	
37	M9200200004	PLUG	1	
38	0150000018	O-RING	1	
39	0016906020	HEX HEAD BOLT	2	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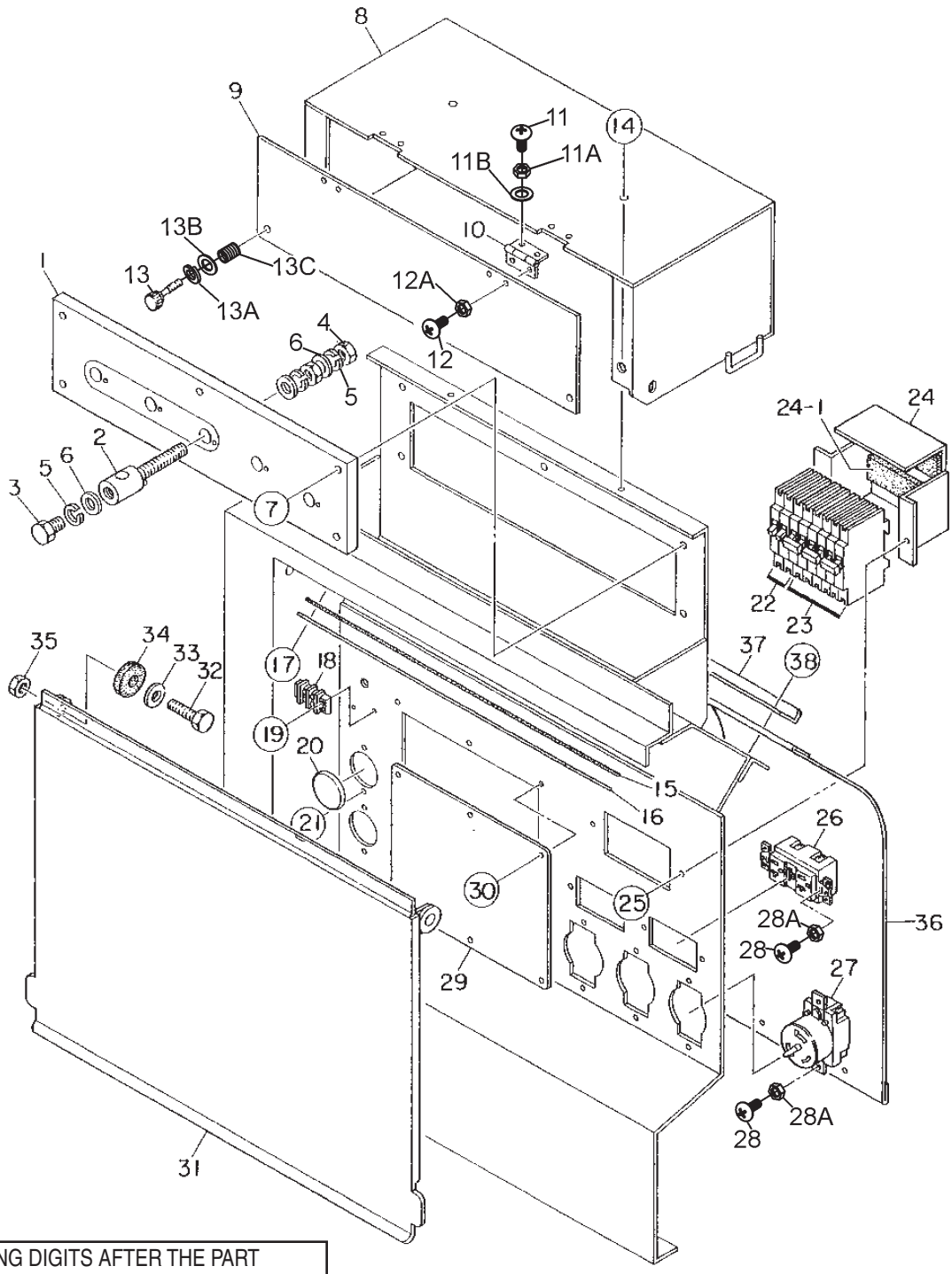
NO.	PART NO.	PART NAME	QTY.	REMARKS
40	0199901700	DRAIN HOSE	1	
41	0605515106	HOSE BAND	2	
42	0602022581	ADAPTER	1	
43	0602022561	90 DEGREE ELBOW	1	
44	0603306590	CONNECTOR	1	
45	0603300285	LOCKNUT	1	
46	0605511395	VALVE	1	
47	0603306395	HOSE JOINT	1	
48	0602021050	CAP	1	
49	0269200500	DRAIN HOSE	1	
50	M9300000103	RESERVE TANK	1	
51	M9300100003	CAP, RESERVE TANK	1	
52	0199100500	HOSE	1	
53	0199100175	HOSE	1	
54	0193601850	HOSE	1	
55	0605515106	HOSE BAND	3	
56	M2316100304	BRACKET, RESERVE TANK	1	
57	0016908020	HEX HEAD BOLT	2	
58	8121468300	SENSOR, WATER TEMPERATURE	1	
59	8971256001	SWITCH, WARNING OVERHEAT	1	
60	8980274560	SENSOR, OIL PRESSURE	1	
61	1096300850	GASKET, SENSOR OIL PRESSURE	1	

OUTPUT TERMINAL ASSY.



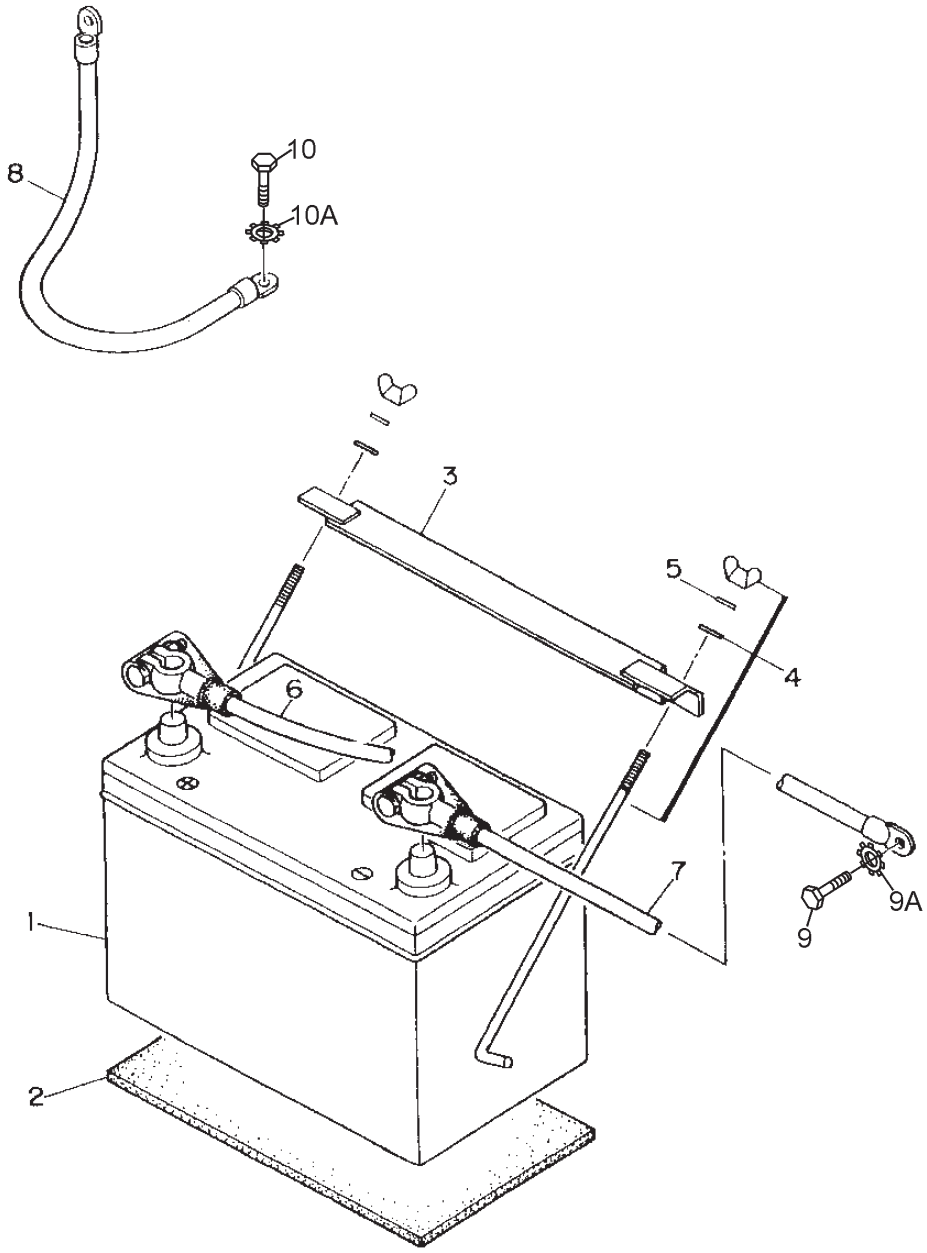
ADD THE FOLLOWING DIGITS AFTER THE PART NUMBER WHEN ORDERING ANY PAINTED PANEL TO INDICATE COLOR OF UNIT:

1-ORANGE	5-BLACK
2-WHITE	6-CATERPILLAR YELLOW
3-SPECTRUM GREY	7-CATO GOLD
4-SUNBELT GREEN	8-RED

THE SERIAL NUMBER MAY BE REQUIRED.

OUTPUT TERMINAL ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	M3230700003	TERMINAL PANEL	1	
2	M9220100304	OUTPUT TERMINAL BOLT	5	
3	M9220100404	TIE BOLT	5	
4	0039316000	HEX NUT	10	
5	0040016000	WASHER, LOCK	15	
6	0041416000	WASHER, FLAT	20	
7	0016908035	HEX HEAD BOLT	5	
8	M3236100803	TERMINAL COVER	1	
9	M3236100104	OUTPUT WINDOW	1	
10	0605010040	HINGE	2	
11	0027103010	MACNINE SCREW	4	
11A	0030003000	HEX NUT	4	
11B	0041203000	WASHER, FLAT	4	
12	0027103010	MACHINE SCREW	4	
12A	0030003000	HEX NUT	4	
13	M9220100804	SET SCREW	2	
13A	0040006000	WASHER, LOCK	2	
13B	0041206000	WASHER, FLAT	2	
13C	0080200005	RETAINING RING	2	
14	0016906016	HEX HEAD BOLT	4	
15	M3236400004	CABLE OUTLET COVER	1	
16	M3236300004	SUPPORTER, CABLE OUTLET COVER	1	
17	0016906020	HEX HEAD BOLT	6	
18	0601815194	TERMINAL	1	
19	0027104016	MACHINE SCREW	2	
20	0603306775	BLIND PLUG	2	
21	0027104016	MACHINE SCREW	4	
22	0601870440	CIRCUIT BREAKER, 1P 20A	2	
23	0601870441	CIRCUIT BREAKER, 2P 50A	3	
24	M1260700504	BREAKER FITTING COVER	1	
24-1	0222100100	CUSHION RUBBER	2	
25	0016906020	HEX HEAD BOLT	2	
26	0601812598	RECEPTACLE, GF530EM 125V 20Ax2	2	
27	0601812538	RECEPTACLE, CS6369 250V 50A	3	
28	0027104016	MACHINE SCREW	10	
28A	0207004000	HEX NUT	10	
29	M2453400004	COVER	1	
30	0016906016	HEX HEAD BOLT	6	
31	M2236100803	TERMINAL COVER	1	
32	0010112045	HEX HEAD BOLT	2	
33	0041212000	WASHER, FLAT	2	
34	M9310200004	STAY RUBBER	2	
35	0030012000	HEX NUT	2	
36	M4236100604	COVER	1	
37	M4236400304	BRACKET	1	
38	0019206015	HEX HEAD BOLT	2	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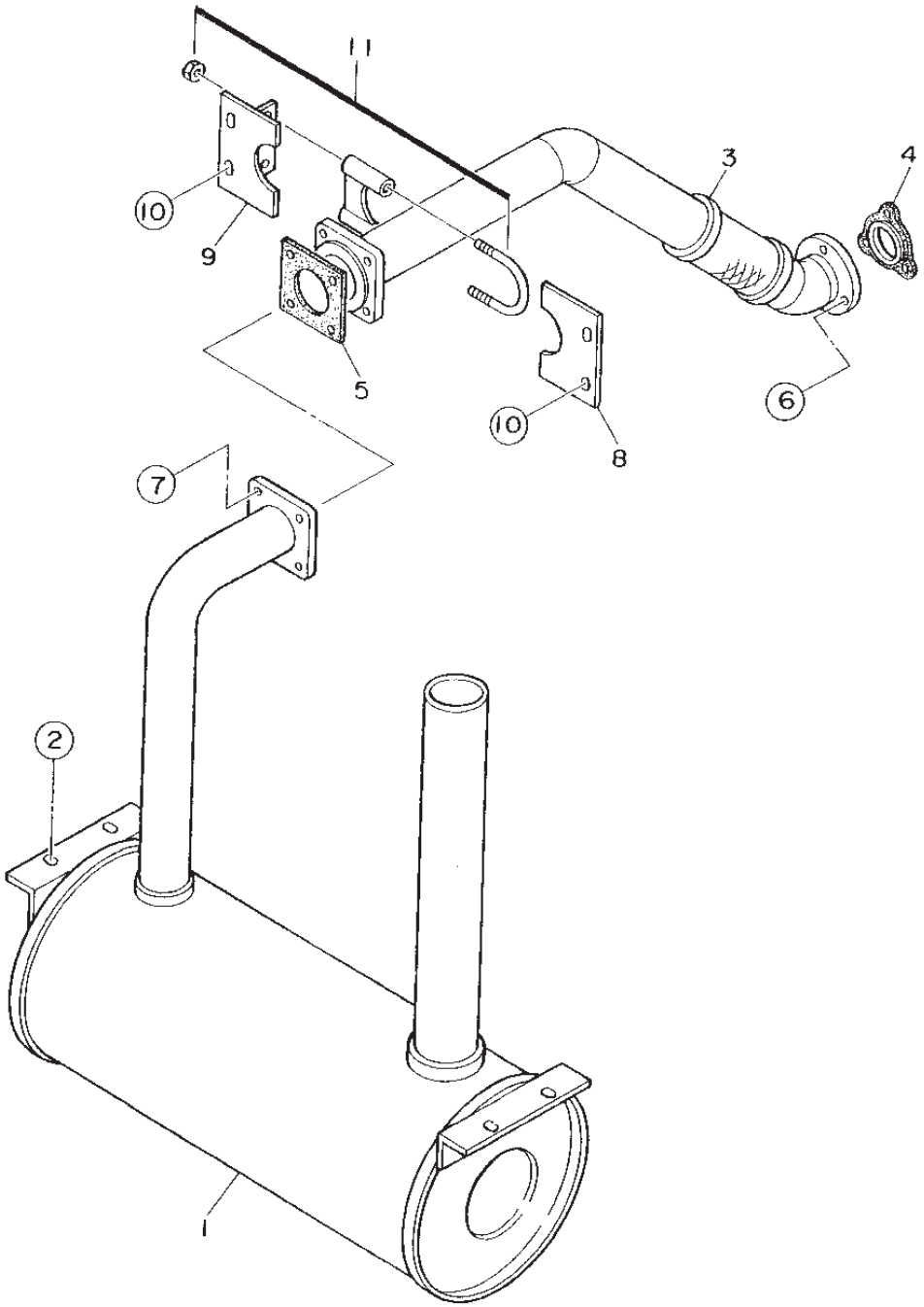
BATTERY ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	0602220199	BATTERY	1	
2	M9310500014	BATTERY SHEET	1	
3	M9103000304	BATTERY BAND	1	
4	0602220920	BATTERY BOLT SET	2	
5	0040006000	WASHER, LOCK	2	
6	M2346900704	BATTERY CABLE	1	
7	M2346900604	BATTERY CABLE	1	
8		CABLE	1	MAKE LOCALLY
9	0017112025	HEX HEAD BOLT	1	
9A	0040512000	TOOTHED WASHER	1	
10	0016910025	HEX HEAD BOLT	1	
10A	0040510000	TOOTHED WASHER	1	

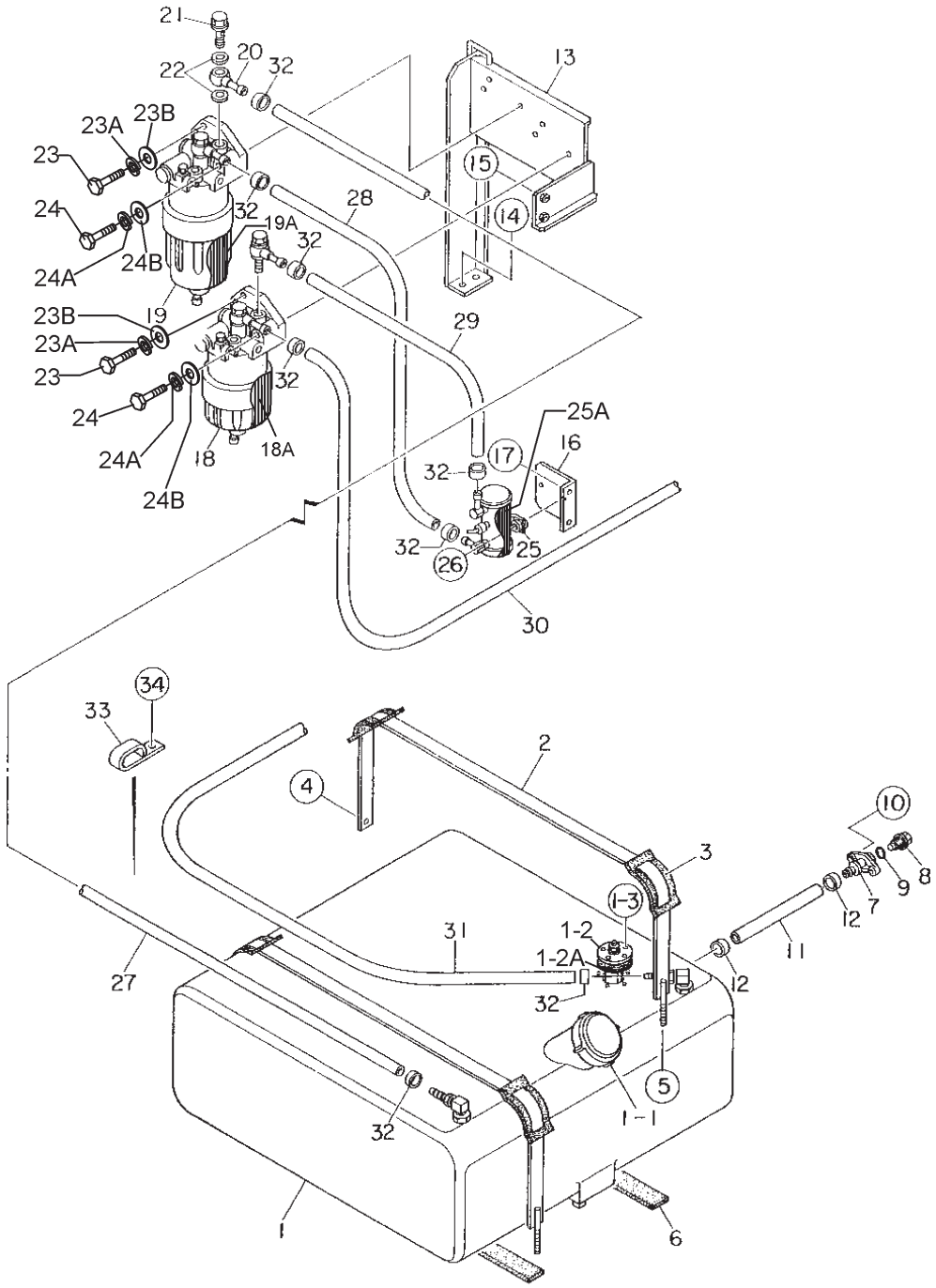
MUFFLER ASSY.



MUFFLER ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	M2330101203	MUFFLER	1	
2	0016910025	HEX HEAD BOLT	4	
3	M2333001503	EXHAUST PIPE	1	
4	8943690210	GASKET	1	REPLACES P/N 0602320101
5	M2333200504	GASKET	1	
6	0039308000	HEX NUT	6	
7	0016908040	HEX HEAD BOLT	4	
8	M2333300204	COVER, EXHAUST PIPE	1	
9	M2333300304	COVER, EXHAUST PIPE	1	
10	0016908020	HEX HEAD BOLT	4	
11	0602326090	U-BOLT	1	

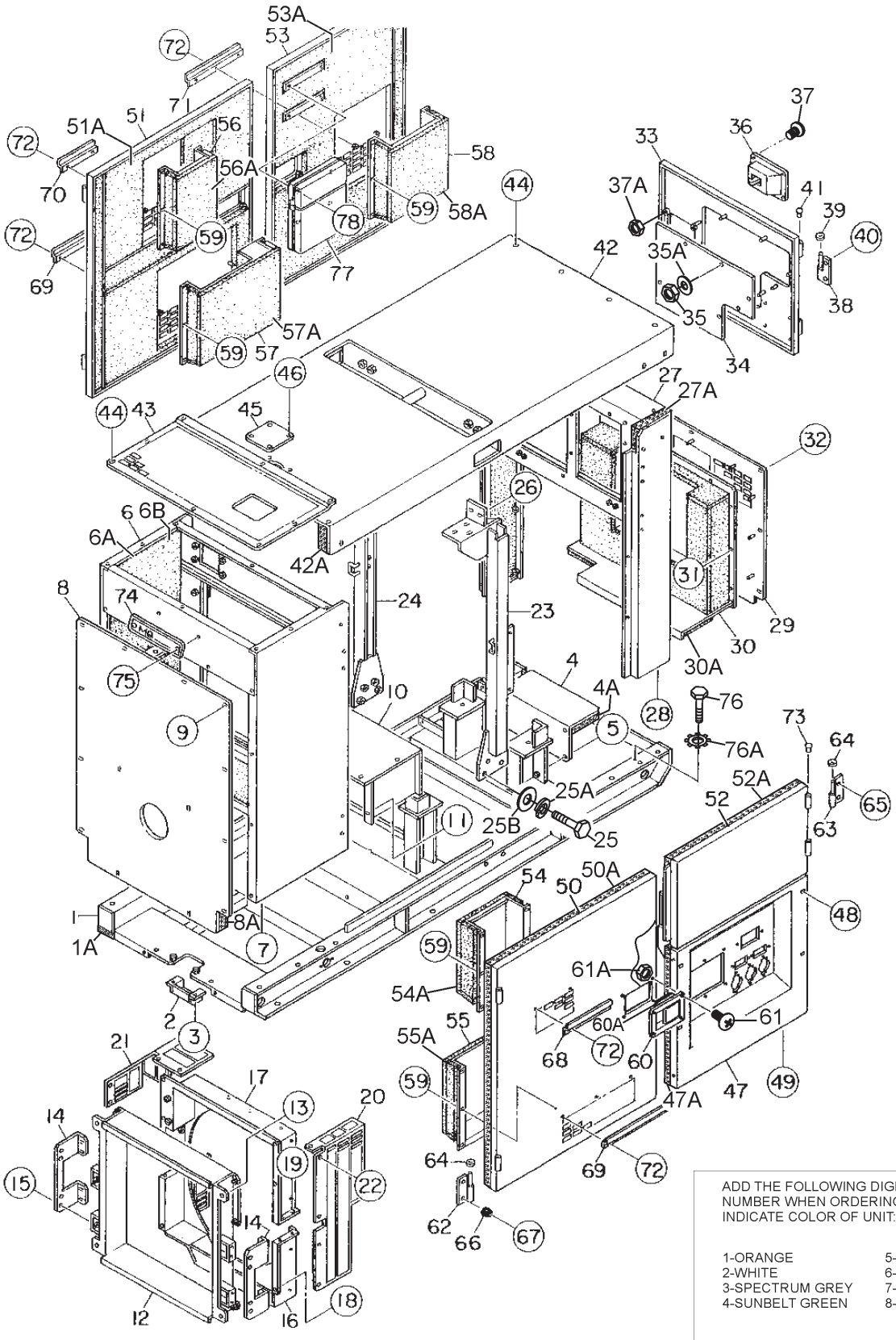
FUEL TANK ASSY.



FUEL TANK ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	M2363000102	FUEL TANK	1	
1-1	0605505070	CAP, FUEL TANK	1	
1-2	0605501074	FUEL SENDER UNIT	1	
1-2A	0605516090	GASKET	1	
1-3	0027104016	MACHINE SCREW	5	
2	M2363200104	TANK BAND	2	
3	M9310500104	SUPPORTER SHEET	4	
4	0016908020	HEX HEAD BOLT	2	
5	0207308000	HEX NUT	2	
6	0222100178	RUBBER SHEET	4	
7	M9200000003	DRAIN JOINT	1	
8	M9200200004	DRAIN BOLT	1	
9	0150000018	O-RING	1	
10	0016906020	HEX HEAD BOLT	2	
11	M1363400104	DRAIN HOSE	1	
12	0605515198	HOSE BAND	2	
13	M2366700203	FUEL FILTER BRACKET	1	
14	0016910025	HEX HEAD BOLT	2	
15	0016908020	HEX HEAD BOLT	2	
16	M2366700104	FUEL PUMP BRACKET	1	
17	0016908020	HEX HEAD BOLT	2	
18	8980139861	FUEL FILTER (MAIN)	1	REPLACES P/N 0602042426
18A	8980088400	ELEMENT, FUEL FILTER, (MAIN)	1	REPLACES P/N 0602042515
19	8980758550	FUEL FILTER (PRE)	1	REPLACES P/N 0602042405
19A	8980758540	ELEMENT, FUEL FILTER, (PRE)	1	REPLACES P/N 0602042516
20	8973834270	JOINT PIPE	1	REPLACES P/N 0602042661
21	1096750951	JOINT BOLT	4	REPLACES P/N 0602042621
22	1096300860	PACKING	8	REPLACES P/N 0602042641
23	0015310045	HEX SOCKET HEAD CAP SCREW	4	
23A	0040010000	WASHER, LOCK	4	
23B	0041210000	WASHER, FLAT	4	
24	0010110080	HEX HEAD BOLT	2	
24A	0040010000	WASHER, LOCK	2	
24B	0041210000	WASHER, FLAT	2	
25	8980682750	FUEL FEED PUMP	1	REPLACES P/N 0602023240
25A	8980714010	FUEL FILTER	1	REPLACES P/N 0602042517
26	0016906025	HEX HEAD BOLT	2	
27	0191301750	SUCTION HOSE	1	
28	0191300650	SUCTION HOSE	1	
29	0191300450	SUCTION HOSE	1	
30	0191301400	SUCTION HOSE	1	
31	0191302150	RETURN HOSE	1	
32	0605515109	HOSE BAND	10	
33	0602220911	CLAMP	1	
34	0016908020	HEX HEAD BOLT	1	

ENCLOSURE ASSY.



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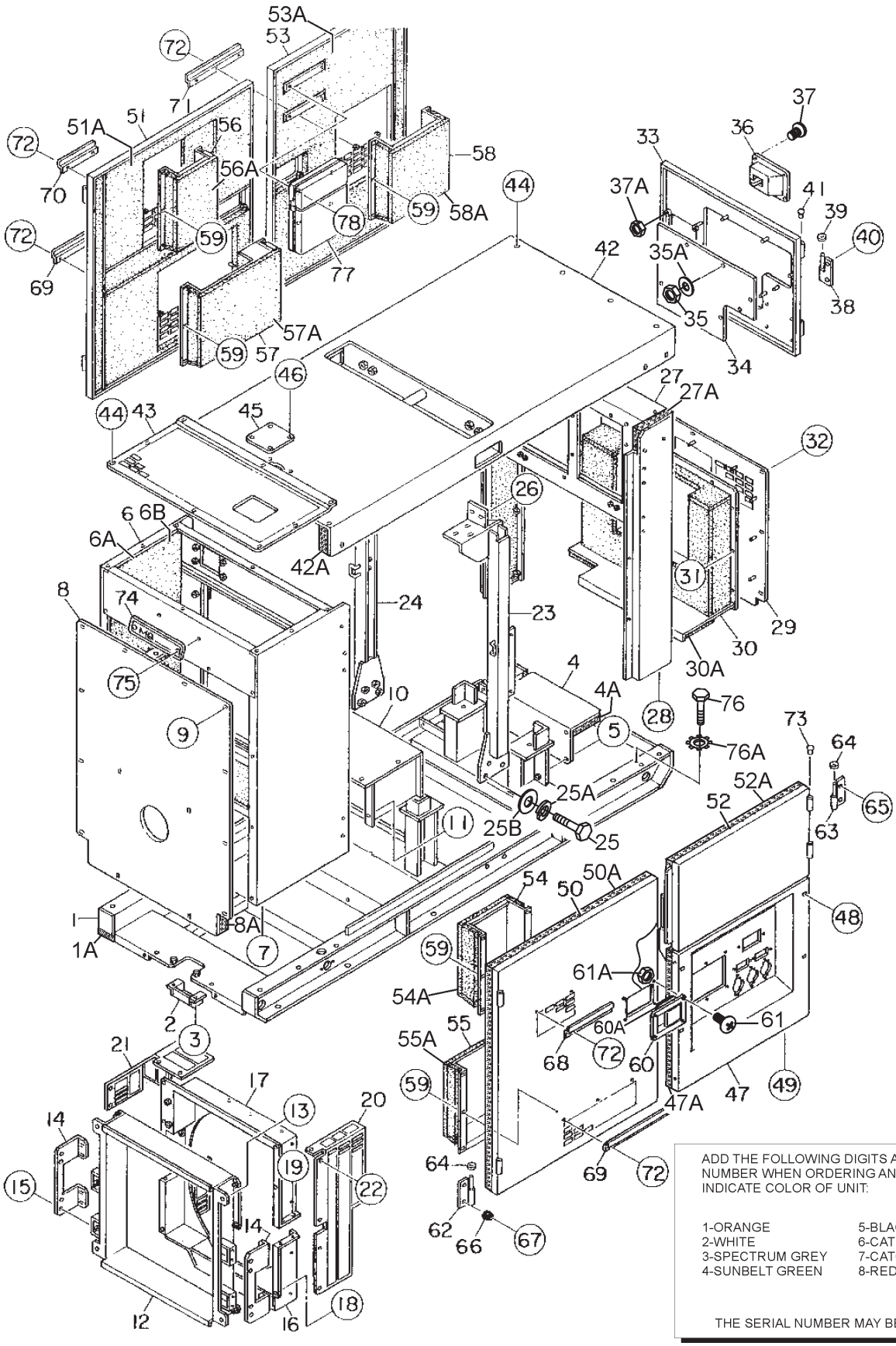
THE SERIAL NUMBER MAY BE REQUIRED.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	M2413002102	BASE	1	
1A	M2493000004	ACOUSTIC SHEET	1	
2	M1413400004	UNDER COVER	1	
3	0016908020	HEX HEAD BOLT	2	
4	M2413600004	DUCT	1	
4A	M2493000104	ACOUSTIC SHEET	1	
5	0016908020	HEX HEAD BOLT	4	
6	M2423001902	FRONT FRAME	1	
6A	M2493108703	ACOUSTIC SHEET	1	
6B	0228800100	SEAL RUBBER	4	
7	0016908020	HEX HEAD BOLT	6	
8	M2423202504	COVER, FRONT FRAME	1	
8A	M2493101104	ACOUSTIC SHEET	1	
9	0019208020	HEX HEAD BOLT	14	
10	M2423202703	INNER COVER, FRONT FRAME	1	
11	0016908020	HEX HEAD BOLT	7	
12	M2310200603	SUPPORTER, INTER COOLER	1	
13	0017110020	HEX HEAD BOLT	4	
14	M2310200504	BRACKET, INNER COOLER	2	
15	0016908020	HEX HEAD BOLT	8	
16	M2310302803	FAN SHROUD	1	
17	M2310302903	FAN SHROUD	1	
18	0016908020	HEX HEAD BOLT	6	
19	0016908020	HEX HEAD BOLT	4	
20	M2310303004	FAN GUARD	1	
21	M2310303103	FAN GUARD	1	
22	0016908020	HEX HEAD BOLT	9	
23	M2435000203	HANGER	1	
24	M2433001103	HANGER	1	
25	0010114030	HEX HEAD BOLT	8	
25A	0040014000	WASHER, LOCK	8	
25B	0041214000	WASHER, FLAT	8	
26	0017112030	HEX HEAD BOLT	10	
27	M2443001302	REAR FRAME	1	
27A	M2493305404	ACOUSTIC SHEET	2	
28	0016908020	HEX HEAD BOLT	4	
29	M2443301203	REAR COVER	1	
30	M2443301703	DUCT, REAR COVER	1	
30A	M2493305303	ACOUSTIC SHEET	1	
31	0207006000	HEX NUT	12	
32	0019208020	HEX BOLT	9	
33	M2443200123	REAR DOOR	1	
34	M1443600204	WINDOW PLATE	1	
35	0037906000	HEX NUT	8	
35A	0041206000	WASHER, FLAT	8	



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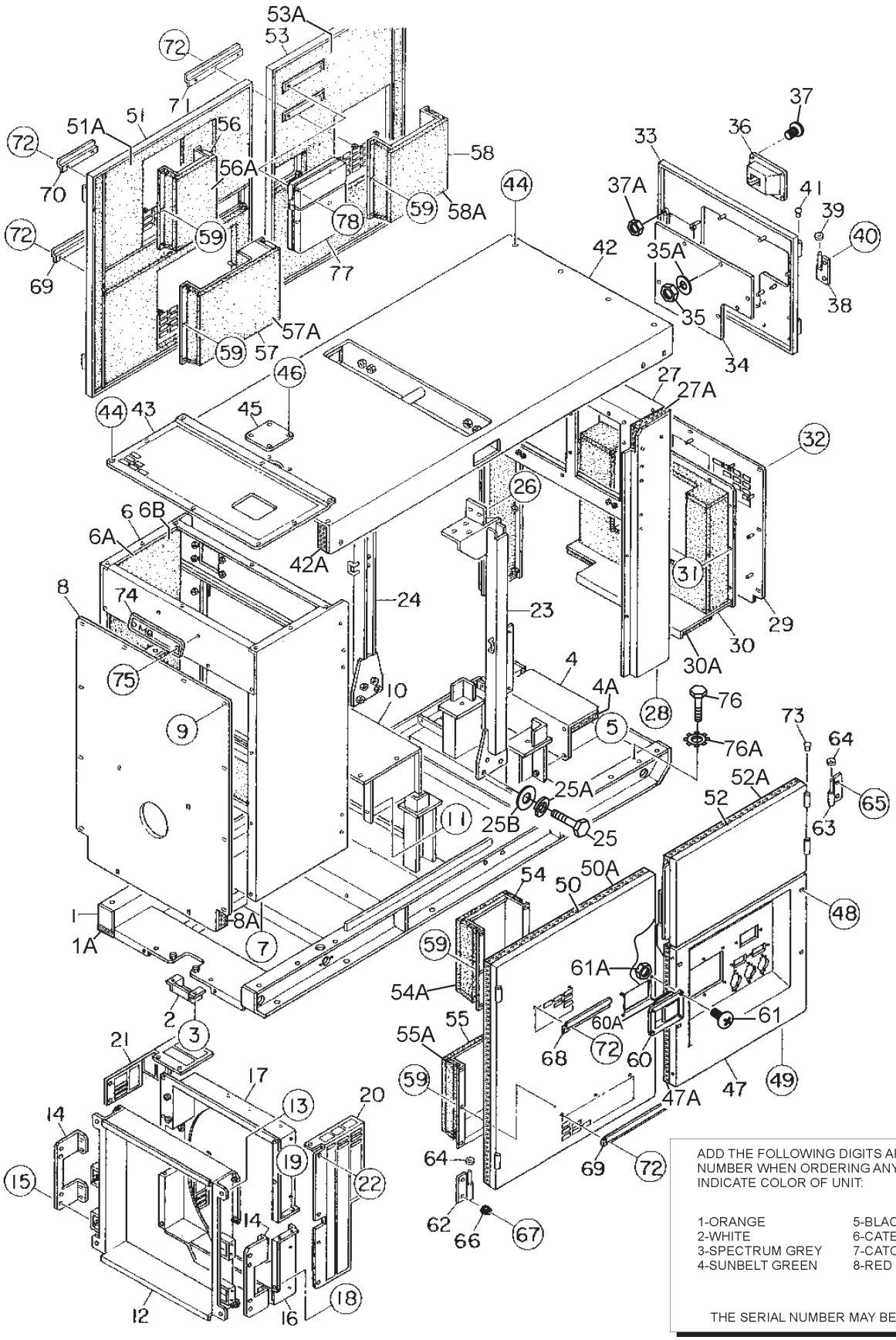
THE SERIAL NUMBER MAY BE REQUIRED.

NO.	PART NO.	PART NAME	QTY.	REMARKS
36	M9113000002	DOOR HANDLE ASSY	1	
37	0021806016	MACHINE SCREW	4	
37A	0030006000	HEX NUT	4	
38	M9110100204	HINGE	2	
39	M9116100004	WASHER	2	
40	0019208020	HEX HEAD BOLT	3	
41	M9310000004	BLIND PLUG	2	
42	M2463000602	ROOF PANEL	1	
42A	M2493505103	ACOUSTIC SHEET	1	
43	M2423203104	OVER COVER, FRONT FRAME	1	
44	0019208020	HEX HEAD BOLT	18	
45	M3310600004	COVER	1	
46	0019208020	HEX HEAD BOLT	4	
47	M2453201902	SPLASHER PANEL	1	
47A	M2493409904	ACOUSTIC SHEET	1	
48	0019108055	HEX HEAD BOLT	4	
48A	M0042308000	WASHER, LOCK	4	
48B	0042408000	WASHER, FLAT	4	
49	0016908020	HEX HEAD BOLT	2	
50	M2453003003	SIDE DOOR	1	
50A	M2493409404	ACOUSTIC SHEET	1	
51	M2453003103	SIDE DOOR	1	
51A	M2493409604	ACOUSTIC SHEET	1	
52	M2453003903	SIDE DOOR	1	
52A	M2493407804	ACOUSTIC SHEET	1	
53	M2453003203	SIDE DOOR	1	
53A	M2493409804	ACOUSTIC SHEET	1	
54	M2453301704	DUCT	1	
54A	M2493412404	ACOUSTIC SHEET	1	
55	M2453301604	DUCT	1	
55A	M2483412404	ACOUSTIC SHEET	1	
56	M2453301804	DUCT	1	
56A	M2493413304	ACOUSTIC SHEET	1	
57	M2453302004	DUCT	1	
57A	M2493412404	ACOUSTIC SHEET	1	
58	M2453301904	DUCT	1	
58A	M2493413904	ACOUSTIC SHEET	1	
59	020706000	HEX NUT	32	
60	M9113000002	DOOR HANDLE ASSY	3	
60A	C9312500004	SEAL RUBBER	3	
61	0021806016	MACHINE SCREW	12	
61A	0030006000	HEX NUT	12	
62	M9110100204	HINGE	4	
63	M9110100304	HINGE	4	
64	M9116100004	WASHER	8	



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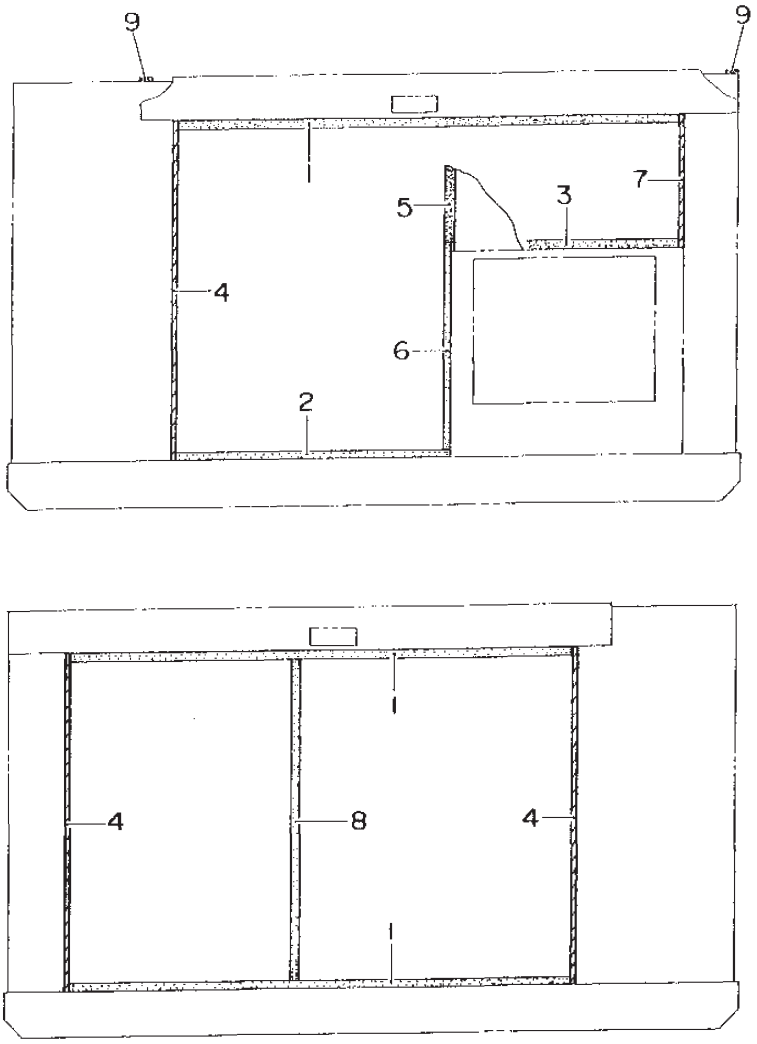
3-SPECTRUM GREY	7-CATO GOLD
4-SUNBELT GREEN	8-RED

THE SERIAL NUMBER MAY BE REQUIRED.

NO.	PART NO.	PART NAME	QTY.	REMARKS
65	0019208020	HEX HEAD BOLT	9	
66	0601850097	DOOR STOPPER	8	
67	0027208025	MACHINE SCREW	8	
68	M2453700204	DOOR BRACKET	1	
69	M2453700304	DOOR BRACKET	2	
70	M2453700404	DOOR BRACKET	1	
71	M2453700504	DOOR BRACKET	1	
72	0019206015	HEX HEAD BOLT	13	
73	M9310000004	BLIND PLUG	8	
74	0600500090	EMBLEM	1	
75	0021106016	MACHINE SCREW	2	
76	0016908020	HEX HEAD BOLT	1	
76A	0040508000	TOOTHED WASHER	1	
77	0600800320	MANUAL PAK	1	
78	0021806016	MACHINE SCREW	4	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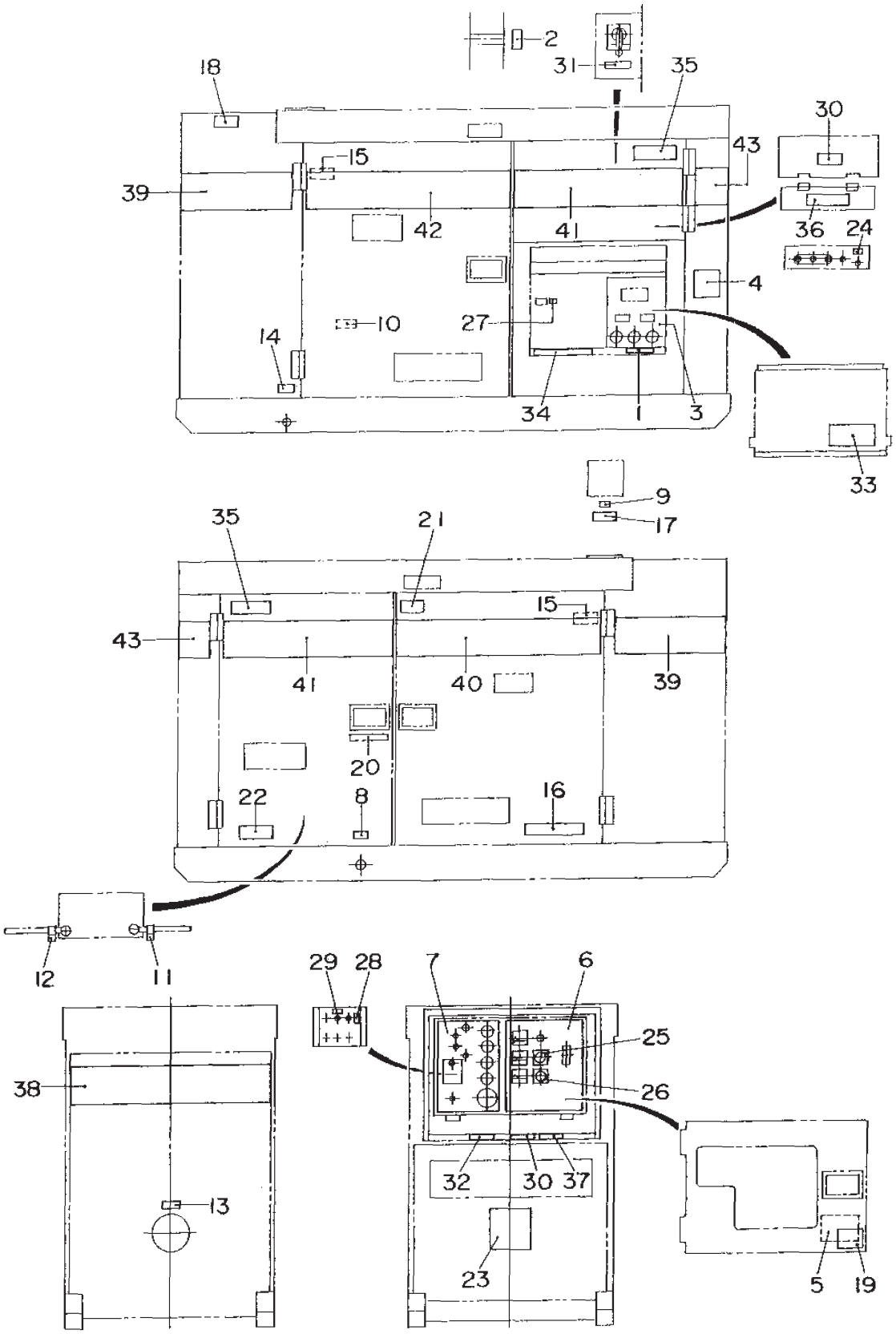
RUBBER SEALS ASSY.

NO.	PART NO.	PART NAME	QTY.	REMARKS
1	0228901660	SEAL RUBBER	3	
2	0228900915	SEAL RUBBER	1	
3	0228900745	SEAL RUBBER	1	
4	0229401120	SEAL RUBBER	3	
5	0229400375	SEAL RUBBER	1	
6	0228800680	SEAL RUBBER	1	
7	0229400440	SEAL RUBBER	1	
8	0228901060	SEAL RUBBER	1	
9	0229200900	SEAL RUBBER	2	
10	0229200840	SEAL RUBBER	1	
11	0228800770	SEAL RUBBER	2	
12	0228800540	SEAL RUBBER	1	
13	0228800580	SEAL RUBBER	1	
14	0228100550	SEAL RUBBER	1	
15	0228100170	SEAL RUBBER	2	
16	0228100350	SEAL RUBBER	1	
17	0228100360	SEAL RUBBER	1	
18	0228100180	SEAL RUBBER	1	

NAMEPLATE AND DECALS ASSY.



NO.	PART NO.	PART NAME	QTY.	REMARKS
1	M1550000204	DECAL : NOTE	1	M15000020
2	M1550001304	DECAL : LIFTING CAP	1	M15000130
3	M1550002203	DECAL : AUXILIARY OUTPUT	1	M15000220
4	M2550000304	DECAL : NOTE	1	M25000030
5	M2550002303	DECAL : OPERATING PROCEDURES	1	M25000230
6	M2550002403	DECAL : GENERATOR CONTROL	1	M25000240
7	M2550002503	DECAL : ENGINE OPERATING	1	M25000250
8	M9500000004	DECAL : OIL DRAIN PLUG	1	M90000000
9	M9500100004	DECAL : WATER	1	M90010000
10	M9500100304	DECAL : INTER- COOLER DRAIN	1	M90010030
11	M9500300004	DECAL : -	1	M90030000
12	M9500300104	DECAL : +	1	M90030010
13	M9500500004	DECAL : DIESEL FUEL	1	M90050000
14	M9500500104	DECAL : FUEL DRAIN PLUG	1	M90050010
15	M9503000004	DECAL : WARNING	2	M90300000
16	M9503000103	DECAL : WATER - OIL CHECK	1	M90300010
17	M9503100004	DECAL : WARNING	1	M90310000
18	M9503200004	DECAL : WARNING	1	M90320000
19	M9503200104	DECAL : DANGER	1	M90320010
20	M9510000104	DECAL : DOCUMENT BOX	1	M91000010
21	M9510100004	DECAL : CAUTION	1	M91010000
22	M9510100403	DECAL : CAUTION	1	M91010040
23	M9510200002	DECAL : MQ	1	M91020000
24	M9520000004	DECAL : GROUND	1	M92000000
25	M9520000104	DECAL : AMMETER CHANGE - OVER SWITCH	1	M92000010
26	M9520000204	DECAL : VOLTMETER CHANGE - OVER SWITCH	1	M92000020
27	M9520000504	DECAL : START CONTACT	1	M92000050
28	M9520000904	DECAL : DIAGNOSTIC SWITCH	1	M92000090
29	M9520001104	DECAL : DIAGNOSTIC BUTTON	1	M92000110
30	M9520100004	DECAL : WARNING	2	M92010000
31	M9520100204	DECAL : CAUTION	1	M92010020A
32	M9520100304	DECAL : SAFETY INSTRUCTIONS	1	M92010030
33	M9520100404	DECAL : DANGER	1	M92010040
34	M9520100503	DECAL : WARNING	1	M92010050
35	M9520100603	DECAL : CAUTION	2	M92010060
36	M9520200003	DECAL : CONNECTION OF OUTPUT CABLE	1	M92020000
37	M9520200404	DECAL : OVER CURRENT RELAY	1	M92020040
38	M2560100003	STRIPE : WHISPERWATT	1	
39	M2560101204	STRIPE : M Q POWER	2	
40	M2560101703	STRIPE	1	
41	M2560101603	STRIPE	2	
42	M2560101503	STRIPE	1	
43	M2560100304	STRIPE : 70	2	

PAYMENT TERMS

Terms of payment for parts are net 30 days.

FREIGHT POLICY

All parts orders will be shipped collect or prepaid with the charges added to the invoice. All shipments are F.O.B. point of origin. Multiquip's responsibility ceases when a signed manifest has been obtained from the carrier, and any claim for shortage or damage must be settled between the consignee and the carrier.

MINIMUM ORDER

The minimum charge for orders from Multiquip is $15.00 net. Customers will be asked for instructions regarding handling of orders not meeting this requirement.

RETURNED GOODS POLICY

Return shipments will be accepted and credit will be allowed, subject to the following provisions:

1. A Returned Material Authorization must be approved by Multiquip prior to shipment.
2. To obtain a Return Material Authorization, a list must be provided to Multiquip Parts Sales that defines item numbers, quantities, and descriptions of the items to be returned.
    a. The parts numbers and descriptions must match the current parts price list.
    b. The list must be typed or computer generated.
    c. The list must state the reason(s) for the return.
    d. The list must reference the sales order(s) or invoice(s) under which the items were originally purchased.
    e. The list must include the name and phone number of the person requesting the RMA.
3. A copy of the Return Material Authorization must accompany the return shipment.
4. Freight is at the sender's expense. All parts must be returned freight prepaid to Multiquip's designated receiving point.
5. Parts must be in new and resalable condition, in the original Multiquip package (if any), and with Multiquip part numbers clearly marked.
6. The following items are not returnable:
    a. Obsolete parts. (If an item is in the price book and shows as being replaced by another item, it is obsolete.)
    b. Any parts with a limited shelf life (such as gaskets, seals, "O" rings, and other rubber parts) that were purchased more than six months prior to the return date.
    c. Any line item with an extended dealer net price of less than $5.00.
    d. Special order items.
    e. Electrical components.
    f. Paint, chemicals, and lubricants.
    g. Decals and paper products.
    h. Items purchased in kits.
7. The sender will be notified of any material received that is not acceptable.
8. Such material will be held for five working days from notification, pending instructions. If a reply is not received within five days, the material will be returned to the sender at his expense.
9. Credit on returned parts will be issued at dealer net price at time of the original purchase, less a 15% restocking charge.
10. In cases where an item is accepted, for which the original purchase document can not be determined, the price will be based on the list price that was effective twelve months prior to the RMA date.
11. Credit issued will be applied to future purchases only.

PRICING AND REBATES

Prices are subject to change without prior notice. Price changes are effective on a specific date and all orders received on or after that date will be billed at the revised price. Rebates for price declines and added charges for price increases will not be made for stock on hand at the time of any price change.

Multiquip reserves the right to quote and sell direct to Government agencies, and to Original Equipment Manufacturer accounts who use our products as integral parts of their own products.

SPECIAL EXPEDITING SERVICE

A $35.00 surcharge will be added to the invoice for special handling including bus shipments, insured parcel post or in cases where Multiquip must personally deliver the parts to the carrier.

LIMITATIONS OF SELLER'S LIABILITY

Multiquip shall not be liable hereunder for damages in excess of the purchase price of the item with respect to which damages are claimed, and in no event shall Multiquip be liable for loss of profit or good will or for any other special, consequential or incidental damages.

LIMITATION OF WARRANTIES

No warranties, express or implied, are made in connection with the sale of parts or trade accessories nor as to any engine not manufactured by Multiquip. Such warranties made in connection with the sale of new, complete units are made exclusively by a statement of warranty packaged with such units, and Multiquip neither assumes nor authorizes any person to assume for it any other obligation or liability whatever in connection with the sale of its products. Apart from such written statement of warranty, there are no warranties, express, implied or statutory, which extend beyond the description of the products on the face hereof.

Effective: February 22, 2006

OPERATION AND PARTS MANUAL

HERE'S HOW TO GET HELP

PLEASE HAVE THE MODEL AND SERIAL NUMBER ON-HAND WHEN CALLING

MQ Power

1800 Water Ridge Rd. Tel. (800) 883-2551
Suite 500/600 Fax (972) 315-1847
Lewisville, TX 75057
Contact: mqpower@multiquip.com
Web: www.mqpower.com

MQ Parts Department

800-427-1244 Fax: 800-672-7877
310-537-3700 Fax: 310-637-3284

Service/Tech Support/Warranty

800-835-2551 Fax: 310-638-8046

This manual MUST accompany the equipment at all times. This manual is considered a permanent part of the equipment and should remain with the unit if resold.

The information and specifications included in this publication were in effect at the time of approval for printing. Illustrations, descriptions, references and technical data contained in this manual are for guidance only and may not be considered as binding. Multiquip Inc. reserves the right to discontinue or change specifications, design or the information published in this publication at any time without notice and without incurring any obligations.

Your Local Dealer is:

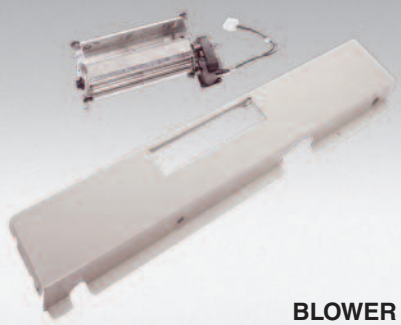
Manufactured for Multiquip Inc. by DENYO CO., LTD, JAPAN

SUNSTAR SPACE HEATERS

Fireside Warmth At A Comfortable Price

INTRODUCING THE NEW SC MODEL SERIES FROM SUNSTAR®

New, Modern Styling Fits Any Decor



BLOWER OPTION

To improve the distribution of the warmth throughout the room, SC models accept an optional blower accessory.

This same blower can be used on SunStar's CK Series Heaters.

SunStar has been designed with many options and features

- **Manual & Thermostat Models**
- **5-Year No Hassle Limited Warranty**
- **ODS & Flame Failure Safety Features**
- **Piezo Ignition – No Electricity Needed. Works Even During Power Outages**
- **Wall Mount Or Floor Mount, As Needed (Floor Stand Included)**
- **Optional Blowers Available With Manual Or Thermostat Models. (Same Blowers Can Be Used On CK Models.)**
- **Can Be Installed In Mobile Homes As Permitted By State And Local Codes**
- **Propane (LP Gas) or Natural Gas Models Available**

SunStar is the choice for comfort. Turn down your central thermostat and turn up the heat in the room of your choice with a SunStar vent-free gas space heater. It's affordable, reliable and virtually 100% efficient. And it even works during power outages.

All SunStar heaters feature attractive modern styling with up-to-date safety features like flame-failure protection and an oxygen detection safety-pilot or ODS. And, each model is CSA design-certified to the current national safety standards. Choose the affordable reliability of the SunStar heater that best fits your needs and turn up your heat and turn down your costs.

SunStar heaters are priced affordably and offer a great value for your home, office or other hard-to-heat areas. SunStar infrared models produce a radiant form of heat that instantly heats people and objects like the sun. So, choose SunStar and choose value.

	MODEL SC18	MODEL SC30
MAX BTU INPUT/NG	18,000	30,000
MAX BTU INPUT/LP	16,500	27,000
HEATER TYPE	INFRARED	INFRARED

Dimensions

WIDTH	19-3/4"	27-1/2"
DEPTH	9-1/2"	
HEIGHT	25"	
SHIPPING WEIGHT	24 lbs.	32 lbs.

Temperature Control Options

MANUAL	YES
THERMOSTAT	YES

Minimum Clearances From Combustible Material

FRONT	36"
TOP	36"
SIDES	13"
BOTTOM (WALL MOUNT)	2"

Accessory Options

FLOOR STAND	INCLUDED
BLOWER	YES

For Your Safety

Installation must be done by a qualified service person. This installation must conform to state and local codes. In the absence of local codes, the installation must conform to the latest edition of NFPA54/ANSI Z223. See your dealer for additional information and thoroughly read the Owner's Manual before installing and operating this heater.

Sunstar Heating Products, Inc.
A Subsidiary of Gas-Fired Products, Inc.
PO Box 36271, Charlotte, NC 28236
Toll Free 1-888-778-6782 Fax (704)332-5843
Email: info@sunstarheaters.com Web: www.sunstarheaters.com

SunStar strives to improve quality and performance on a continuing basis and reserves the right to change specifications and materials without notice.

12/09-FORM #A092