TECHNICAL BULLETIN

INSTALLATION OF COMMUNICATIONS-ELECTRONIC EQUIPMENT: HOOKUP OF ELECTRICAL CABLES TO MOBILE GENERATOR SETS ON FIELDED EQUIPMENT TO MEET ELECTRICAL SAFETY STANDARDS

HEADQUARTERS, DEPARTMENT OF THE ARMY

15 SEPTEMBER 1991

5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1 DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

2 IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

3 IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH OR LIFT THE PERSON TO SAFETY USING A DRY WOODEN POLE OR A DRY ROPE OR SOME OTHER INSULATING MATERIAL

4 SEND FOR HELP AS SOON AS POSSIBLE

5 AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

Technical Bulletin

No. 43-0125

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 15 September 1991

INSTALLATION OF COMMUNICATIONS-ELECTRONICS EQUIPMENT: HOOKUP OF ELECTRICAL CABLES TO MOBILE GENERATOR SETS ON FIELDED EQUIPMENT TO MEET ELECTRICAL SAFETY STANDARDS

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

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*This bulletin supersedes TB 43-0125 dated 5 March 1985.

LIST OF FIGURES

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CHAPTER 1
GENERAL INFORMATION

Section I. INTRODUCTION

1-1. Scope

This technical bulletin contains information to enable you to properly interconnect mobile communications- electronic equipment and transportable power generation equipment. The specific items of communications- electronic equipment covered in this TB are listed in table 2-1 of this manual. Paired with each item of equipment are the required power cables and the most likely choice of power generation equipment. The actual interconnection instructions in chapter 2 are presented in the form of wiring diagrams showing the configuration of power cable connector contacts and color-coding of cable conductors.

NOTE

It should be noted that in some cases the power cable/stub color coding as shown in this TB is not in conformance with the National Electrical Code (see paragraph B-5). The color code data was obtained by inspection of the actual equipment or was extracted from applicable technical manuals and engineering drawings. A note appears on diagrams where this discrepancy exists.

Section II of this chapter highlights the major safety considerations to be aware of when working with mobile power generation equipment.

Appendix A is a list of technical publications containing additional information on various aspects of mobile power generation and cabling.

Appendix B is a collection of engineering drawings of the power cables referenced in table 2-1. These drawings are provided to assist the technician in the identification and testing of the cables.

Appendix C contains standard generator set information. This data can be used to select mobile power generation equipment that will be compatible with communications-electronic equipment not listed in table 2-1. In addition, instructions are provided for selecting a single, centralized power source to provide power to several shelters at a single worksite.

A glossary of electrical terms, relevant to the safety information provided, is located in the rear of the TB.

1-2. How to Use This Bulletin

a. Familiarize yourself with the safety precautions in section II of this chapter before connecting or operating any mobile power generation equipment.

b. Refer to table 2-1 and locate nomenclature of your equipment. Obtain technical manuals listed in the table for the shelter/equipment and the mobile power generation equipment you will be using.

c. Inspect the power cable(s) issued with your shelter/equipment and locate the cable identification marking band(s). Compare the cable identification number with the cable number(s) listed in table 2-1 for your equipment. If the cable numbers on the actual equipment do not agree with those in the table, refer to Reporting Errors and Recommending Improvements on page i of this TB and notify this headquarters using DA Form 2028. Indicate on the form which equipment you are using and what cables have been issued with it.

d. Refer to the generator hookup diagram referenced in table 2-1 and interconnect shelter/equipment and power generation equipment in accordance with the diagram.

NOTE

On equipments which use the CX-7705 power cable stub, the wire colors on your stub may not agree with the colors shown in the cable illustration (figure B-7). If your cable stub has a red-colored conductor, wrap a length of green-colored tape, NSN 5970-01-013-9366, around this conductor to make color code on stub conform to figure B-7. (For 3-wire, single-phase use only).

Section II. SAFETY PRECAUTIONS

1-3. General

The material in this section is provided to give the operator an understanding of the safety considerations involved in using mobile power generation equipment. Separate paragraphs address such safety-related topics as phase/voltage matching, fire hazards, and cable placement. Because proper grounding is crucial to safe operation, an effort has been made to cover this subject in depth. Make certain to read and understand all of the information in this section before attempting to connect and operate mobile power generation equipment.

1-4. Grounding Theory

The term grounding refers to intentionally connecting an electrical installation to the earth at one or more points. This connection to the earth is made using a grounding rod, or similar electrode, buried in the earth. There are two kinds of grounding: system grounding and equipment grounding. The generator hookup wiring diagrams in chapter 2 show both kinds.

System grounding is the grounding of one of the current-carrying wires in the circuit made up of the generator set(s) and the shelter/equipment.

Equipment grounding is the grounding of the frame and structure of the generator sets and shelter/equipment. In other words, every part of the installation that does not normally carry current.

The purpose of either type of grounding is to provide a path for stray currents, caused by shorts or ground faults (see paragraph 1-13), that would otherwise seek to travel to the earth through whatever means available. If the operator should become a conductor between the earth and an accidentally-energized component or structure, electrocution could be the result. The presence of an equipment grounding system will minimize, if not eliminate entirely, the risk of electrocution. Proper grounding also prevents the buildup of static electricity and minimizes hazards caused by lightning. Paragraph 1-5 explains how an equipment grounding system is created through the process of bonding.

1-5. Equipment Bonding

Bonding is the technique of connecting equipment components together in such a way as to form an uninterrupted path-to-earth for stray currents. This is done to achieve equipment grounding. On mobile power generation equipment, the generator sets are bonded to their respective trailers in two ways. First, the attaching hardware forms a bond which is sometimes made more efficient with the addition of star washers. The star washers bite into the metal through the paint or protective coating to make and maintain better electrical contact. Second, and most important, a braided metal strap is connected between the grounding stud on the generator set frame and the ground stud on the trailer frame or body. When a power transfer switch box is mounted on the trailer as part of a power plant, it too is bonded to the trailer in the same manner. A braided metal strap connects the box housing the switch to the trailer ground stud. This bonding system insures that generators, trailers, and switch boxes are joined at the same point and are therefore at the same potential. The equipment ground system is completed when the trailer ground stud is connected to a good source of earth ground.

In communications/electronics shelters, there is frequently a grounding strip, or conductor, running around the inside of the shelter on the walls or ceiling. This conductor is bonded to the grounding bus bar inside the shelter's power entrance box.

The grounding bus bar is connected to the shelter ground stud. Equipment mounting racks and chassis are bonded to this grounding strip and to each other with braided metal straps. Individual components are bonded to the racks through mounting hardware or through the equipment ground conductor in three-wire power cords. The equipment grounding system is completed when the shelter ground stud is connected to a good source of earth ground. Before connecting any power conductors or earth grounds, make certain that the shelter/equipment and power generation equipment bonding systems described above are in place and the bonding straps are intact and tightly fastened.

NOTE

Any time a power unit/plant or communications-electronic shelter facility is returned to service from a higher level maintenance facility, reinspect bonding system before using equipment.

1-6. Sources of Earth Ground

As discussed in paragraph 1-5, all operational mobile power generation equipment and communications- electronics shelters must be connected to a good source of earth ground. The generator hookup diagrams in this TB use an illustration of a ground rod to symbolize earth ground. It should be remembered, however, that a ground rod is not the only source of earth ground. Three sources of earth ground, including rods, are listed below in order of preference. Whichever source is used, it must be connected to the equipment ground stud with a copper wire of at least No. 6 AWG.

a. An underground water system, of the kind supplying water to a permanent structure, is an excellent source of earth ground. If available, ground the equipment to any accessible pipe. If possible, select a pipe near where the system exits the earth. Make certain beforehand that the underground portion of the water system is made of metal pipe and that there is no insulation, such as a water meter, between the ground wire connection point and the earth.

b. A ground rod, to be effective, must make sufficient contact with the earth. To do this, the rod must have a minimum diameter of 5/8-inch, if solid, or 3/4-inch, if pipe, and be driven a minimum of eight feet into the earth. If soil conditions are dry, it may be necessary to saturate the area around the ground rod with water to insure a good ground.

c. A ground plate can be used as an earth ground electrode. The plate must be buried at a depth of four feet and should cover a minimum area of nine square feet.

Do not take chances. If you have any reason to believe your equipment is not properly grounded, do not operate equipment until you have installed a second source of ground.

1-7. Additional Equipment Grounding Required at Multiple Facility Worksites

When the Equipment Ground Conductor (EGC) is connected between the power generation equipment and the shelter/equipment, the bonding systems in each are connected and both end items are kept at the same potential. This means that there is no voltage difference between the generator set and equipment being powered that could cause a current flow if the two were to come into contact with each other. When several independently-powered facilities are installed and operated at a single worksite, they may not all be at the same potential. This is possible even if each facility is properly grounded and at zero potential with respect to its associated power source. This situation becomes a hazard if the facilities are positioned in such a way that personnel can come into contact with two facilities at the same time. If a difference in potential exists between two shelters, vehicles, distribution boxes, etc., and an individual touches both, they become a conductor for the resulting current flow and a serious shock can be the result. The solution to this problem is simple. Bond all adjacent shelters by installing EGC's of at least No. 6 AWG wire between the equipment ground studs or their earth ground electrodes. In this way, differences in potential are equalized and the danger of electrical shock is eliminated.

1-8. System Grounding

As explained in paragraph 1-4, Grounding Theory, there are two kinds of grounding applicable to the generation and use of electrical power in the field: equipment grounding and system grounding. The material presented elsewhere in this chapter concerning equipment bonding and grounding at multiple facility worksites, is concerned primarily with equipment grounding for safety.

System grounding is the intentional grounding of one of the current-carrying conductors connecting the generator set to the shelter/equipment. In the generator hookup diagrams in chapter 2, the grounded conductor is referred to as the neutral conductor. Although this nomenclature is used on both single-phase and polyphase installations, it should be noted that in a two-wire, single-phase circuit, the grounded conductor is not a "neutral" wire in the same sense it is in a multi-phase system. It is, simply, the grounded conductor. For the sake of consistency and clarity however, the grounded conductor is referred to as the neutral conductor throughout this TB.

The connection of the equipment to earth ground occurs at a minimum of two places - the power generation equipment ground stud and the shelter/equipment ground stud. If the power system utilizes intermediate power distribution boxes or remote switch boxes, these items will also be grounded to insure safety. In short, the equipment ground system can be connected to earth ground at as many points in the system as required to insure safety. System grounding in a transportable power installation, however, occurs at only one point. The neutral conductor is connected to ground at its point of origin on the output terminal board of the power unit or power plant.

NOTE

Exceptions to this grounding convention are discussed in paragraphs 1-9, Floating Neutral Systems, and 1-10, Power Distribution Panels and Feeder Boxes.

In most of the generator sets addressed in this TB, there is an internal connection between terminal LO and the generator set ground stud. Therefore, connection to terminal LO automatically grounds the neutral conductor. In installations where the neutral conductor is connected to a terminal other than LO, or when using a generator set under 10 KW which may not have any grounded terminals, system grounding is accomplished by grounding the selected terminal to the power equipment ground stud using a No. 6 AWG wire. This method of system grounding is shown in the generator hookup diagrams.

CAUTION

If you are unsure if the neutral terminal of the generator set you are using is internally bonded to ground stud, perform a continuity check to verify this connection. There should be continuity, without resistance, between the neutral terminal and the generator set ground stud. If continuity does not exist between these two points, bond neutral terminal to ground stud externally using No. 6 AWG wire before attemping to connect and operate generator set.

In a communications-electronics shelter facility, the neutral (white) wiring system, including the neutral bus, must be electrically isolated from the frame of the shelter. This is because the shelter frame is grounded as part of the equipment grounding system, and the neutral conductor may only be grounded at its point of origin. This is in accordance with requirements of Article 550-9 of the National Electrical Code. Upon receipt of a new shelter facility, or the return of a previously used shelter from higher level maintenance repair, a continuity check must be performed before operating the facility for the first time. This check is done to verify that the neutral contact in the shelter's power input connector, and therefore the neutral bus, has not somehow been grounded during fabrication or repair. Perform the continuity check as follows:

a. Locate your equipment nomenclature in table 2-1 and identify the associated generator hookup diagram.

b. Refer to generator hookup diagram to determine which socket or pin is the neutral contact in the shelter's power input connector.

NOTE

If your equipment is not listed in table 2-1, refer to schematics or wiring diagrams in applicable technical manuals to locate input connector neutral contact.

c. Set main circuit breaker to ON position.

NOTE

This must be done because in some shelter facilities, the circuit breaker will break the neutral conductor inside the power entrance panel. If the neutral conductor is grounded at a point beyond the circuit breaker, a continuity test would then fail to detect the short.

d. Preset multimeter to perform a continuity check and test for continuity between neutral contact and shelter ground stud. There must not be continuity between these points.

1-9. Floating Neutral Systems

Some equipments are designed to operate on three-phase power with an ungrounded neutral conductor. This is termed a floating neutral system. On generator sets with output ratings below 10 KW, the generator output terminals L1, L2, L3, and LO are isolated from the generator frame. This configuration permits these generators to be used with either a grounded neutral or a floating neutral power distribution system. When used in a standard five-wire installation, the neutral terminal of the generator must be connected to the generator set ground stud with a wire jumper of at least No. 6 AWG copper wire. The power requirements for shipboard service may differ. Consult the proper technical document for setting up the generators for shipboard use.

1-10. Power Distribution Systems and Feeder Boxes

As explained in paragraph 1-8, System Grounding, the grounded conductor in a mobile power generation installation is normally grounded at only one point. That point is the conductors point of origin at the power source. In a shelter facility, unlike a permanent structure, the neutral bus bar is not grounded in the power entrance box. An exception to this practice exists when power distribution panels and feeder boxes are used to distribute the power generated by one or more power units/plants to multiple shelter/equipments. Figure 1-1 depicts a power distribution system utilizing a large primary distribution panel with multiple outputs. Outputs from the primary distribution panel, typically in the 60-100 Amp range, are cabled directly to shelter/equipments or to secondary feeder boxes. The feeder boxes split the input power yet further to supply multiple circuits requiring 15-20 Amp input power. In this type of installation, the neutral bus and ground bus in the primary distribution box are bonded together forming a second grounding point for the grounded (neutral) conductor. The neutral and ground bus bars in the secondary feeder boxes, however, are not bonded and the neutral is not grounded.

1-11. Voltage/Phase Matching

Before connecting any shelter/equipment to mobile power generation equipment, make certain the setting of the voltage/phase selector switch or voltage reconnection board on the generator set(s) matches the load requirements. When two generator sets are interconnected through a power transfer switch box, make certain both generators are set to the same voltage and phase. It is especially important to check voltage settings on power generation equipment returned from repair facilities.

1-12. Power Cable Configuration

Power cables used to carry single-phase power between power generation equipment and the equipment to be powered must contain three conductors: hot, neutral, and EGC. Five-conductor cable is required for three-phase power. A separate hot conductor is required for each phase plus the Neutral and EGC. In either case, the sizes of the individual conductors will have been chosen to safely handle the anticipated maximum load current drawn by the equipment (see table 1-1 for capacities of various size conductors). In many of the equipments listed in table 2-1, the power cable specified for the equipment has only two wires for single-phase or four wires for three-phase. These cables are not considered satisfactory for safety. A No. 6 AWG wire (NSN 6145-00-652-9058) must be secured to the exterior of the power cable so that the shelter ground stud and the power plan/unit ground stud can be connected by this wire. When required, this is illustrated in the generator hookup diagrams.

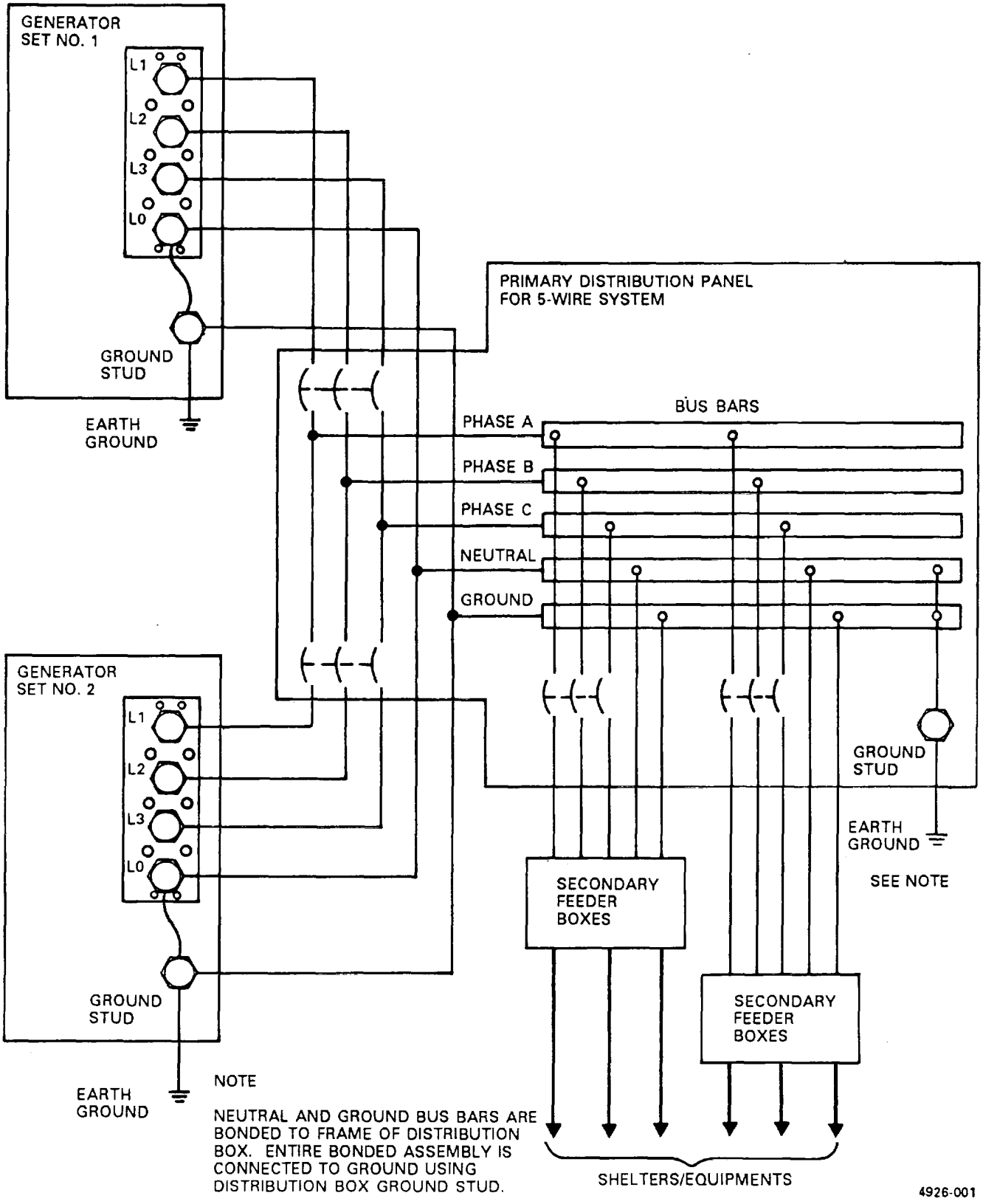


Figure 1-1. Power System Utilizing Primary and Secondary Distribution Boxes.

CAUTION

The power cable provided with your equipment has been designed to safely handle only the equipment normally included in the equipment shelter. The conductor sizes in the cable have an upper current-handling limit. Adding extra equipment or appliances to the electrical system in the shelter may cause your power cable to get hotter than its design limits allow. This is a fire hazard. Do not connect any unauthorized equipment and do not connect any equipment or appliances with incompatible voltage requirements to shelter wiring. Refer to figure 1-2 for amperage and voltage ratings of standard receptacles.

NOTE

Operating generator sets of the 15 KW and under class to supply three-phase WYE (Y) power to separate single-phase loads is not recommended. Refer to appendix C, section 11 for information on this class of power service. Generator sets must be designed for operating as prime power sources for multiple loads. Refer to the generator set technical manuals referenced in table 2-1 for data on the capabilities and limitations of the different generator sets.

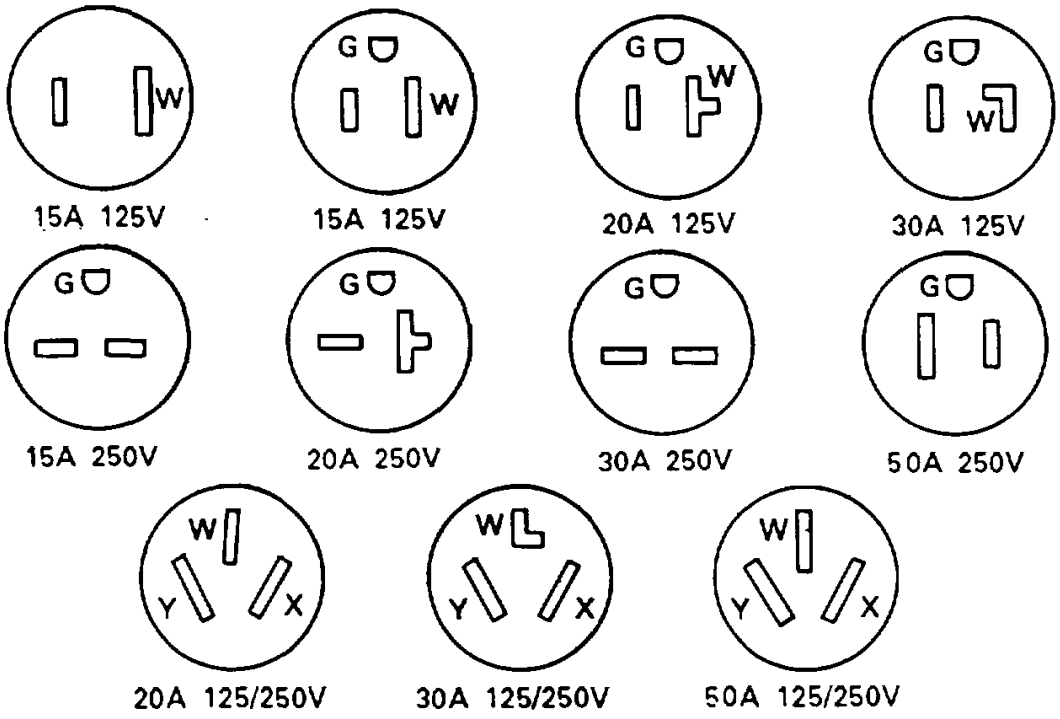


Figure 1-2. Amperage and Voltage Ratings of Standard Receptacles.

Table 1-1. Current-Carrying Capacity of Copper Wire.

Figures in table equal length of cable run in one direction only, and not total length of cable conductors. Distances are expressed in feet. These figures permit a 2% voltage drop. To calculate distances permitting 4% or 5% voltage drop, multiply by 2 or 2.5, respectively.

Table of Wire Sizes for 120 Volts Single Phase.

Amp-eres	Watts at 120 volts	AWG No. 14	AWG No. 12	AWG No. 10	AWG No. 8	AWG No. 6	AWG No. 4	AWG No. 2	AWG No. 1/0	AWG No. 2/0	AWG No. 3/0
5	600	90	140	225	360	570	910				
10	1200	45	70	115	180	285	455	725			
15	1800	30	45	70	120	190	300	480	765	960	
20	2400	20	35	55	90	145	225	360	575	725	915
25	3000	18	28	45	70	115	180	290	460	580	730
30	3600	15	24	35	60	95	150	240	385	485	610
40	4800			28	45	70	115	180	290	360	455
50	6000			23	36	55	90	145	230	290	365

Table of Wire Sizes for 240 Volts Single Phase.

Amp-eres	Watts at 240 volts	AWG No. 14	AWG No. 12	AWG No. 10	AWG No. 8	AWG No. 6	AWG No. 4	AWG No. 2	AWG No. 1/0	AWG No. 2/0	AWG No. 3/0
5	1200	180	285	455	720	1145					
10	2400	90	140	225	360	570	910	1445			
15	3600	60	95	150	240	380	610	970	1530		
20	4800	45	70	115	180	285	455	725	1150	1450	
25	6000	35	55	90	140	230	365	580	920	1160	1460
30	7200	30	48	75	120	190	300	480	770	970	1220
40	9600		36	56	90	140	230	360	575	725	915
50	12,000			45	70	115	185	285	460	580	725
60	14,400				60	95	150	240	385	485	610
70	16,800				50	80	130	205	330	410	520
80	19,200					70	115	180	285	360	460
90	21,000					60	100	160	250	320	405
100	24,000					55	90	145	230	290	365
125	30,000						75	120	190	240	300
150	36,000							95	150	195	245
200	48,000							70	115	145	185

1-13. Short Circuits, Ground Faults, and GFCI Devices

a. The term "short circuit" describes the condition wherein two conductors, normally isolated from each other, have come in contact. When the hot conductor has somehow contacted the neutral conductor, the resulting short circuit will sharply increase the current flow. The circuit breakers positioned to protect the equipment will detect the current surge and/or accompanying heat and open the circuit to prevent further damage. Obviously, the short circuit must be located and repaired before the circuit breaker is reset.

b. A ground fault is a situation wherein there is current leakage between a hot conductor and a grounded component or the EGC. This is potentially a more dangerous condition because it is possible that the leakage will not be great enough to trip a circuit breaker. The same leakage, however, could present a serious shock hazard to personnel. This is especially true if the equipment bonding is defective because the "grounded" component could then be at the same potential as the hot conductor. Anyone touching the component would provide a path to ground for the current leakage.

WARNING

Do not handle power cables when generator is supplying power to equipment. There may be lethal leakage on cable sheath if ground bonding system is not intact.

c. Ground Fault Circuit Interrupt (GFCI) devices are designed to protect personnel from the shock hazards represented by current leakage. GFCI devices do this by monitoring the current flow on both the hot and neutral conductors. The flow on both conductors should be equal. When there is current leakage to ground, it results in an imbalance between the current levels on the two conductors. The GFCI device detects this imbalance and opens the circuit. GFCI devices typically are sensitive enough to detect a current imbalance as slight as 4-6 milliamperes and to open the circuit in 1/40 second. While this won't prevent a shock entirely, it will reduce the severity of the shock to where it will be relatively harmless. GFCI capability can be built into circuit breakers and receptacles or a separately housed GFCI device can be added to a circuit to provide this protection. If your equipment contains GFCI devices, be certain to perform the required inspections at specified intervals using the self-test indicators provided on the devices.

1-14. Split-Voltage Shock Hazards

In some power distributions in equipment shelters, a three-wire 240-volt single-phase service is used. For the sake of identification, we shall call this power distribution "split-voltage." This class of power distribution uses one of the output stators of the power generator which has a 240-voH output from one terminal to the other. This stator is center tapped and the output voltage is divided in half with 120 volts to each side of this center tap. By designating this center tap as neutral and grounding it with a No. 6 AWG jumper at the generator, there will be two hot wires of 120 volts phase-to-neutral with the power shifted in phase by 180 degrees. In the shelter, it is mandatory that all electrical appliances (equipment which is connected to power through a plug) have both conductors isolated from the body (frame) of the equipment. In addition, these plugs must be polarized in such a way that there can be no potential difference from frame-to-frame of the equipment or from frame-to-ground. This potential difference may be caused by interference filters which are sometimes built into the equipment power entrance panel.

1-15. Worksite Safety Precautions

a. Most mobile power generation equipment operates at high noise levels. Wear ear protection when working in vicinity of operating generator sets. Position power units/plants as far away as practical from personnel work stations.

b. Do not allow power cable connectors to be submerged in water. Cap unused connectors to protect against moisture and dirt. Do not run cables through areas where they are endangered by vehicular traffic.

c. Remove fire extinguishers and extra fuel cans from power plant/unit trailers during operation. In the event of fire, the extinguishers will be accessible and extra fuel will not become involved.

d. Periodically inspect power generation equipment to verify that no additional or unauthorized connections have been made.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

1-16. Scope

PMCS charts for CECOM equipment currently do not include checks and services to be performed on associated power generation equipment. Power units/plants are auxiliary items for most CECOM mobile assemblages. As such, power units/plants are authorized for use with the mobile assemblage but are not considered as part of them. Refer to DA Pam 25-30 for applicable power unit/plant technical manuals.

1-17. Use

Refer to the applicable generator set technical manual for the preventive maintenance checks and services to be performed on the power generation equipment. Schedule checks and services to coincide with the PMCS required for the CECOM assemblage.

1-18. Readiness Reporting

For readiness reporting purposes, the power generation equipment is considered mission essential. Under the readiness criteria in DA Pam 738-750, the M (capable of moving) for power unit/plant trailer(s) and O (capable of operation) for the generator set(s) are applicable.

1-19. Administrative Storage

If commercial power is available at a worksite, place the power unit/plant in administrative storage until needed. Perform PMCS on equipment before placing in storage and after removal.

1-20. Engine Care

Do not apply a full load to a generator set until the generator set engine has been sufficiently warmed. Run generator set at normal speed, without load, for 5 to 8 minutes to warm engine. Do not idle generator for excessive periods of time.

Section IV. DIRECT CURRENT GENERATORS AND ROTARY CONVERTERS

1-21. Rotary Converters

There exists some transportable radio teletype facilities that are powered by the electrical systems of the vehicles upon which they are carried. A DC to AC rotary converter unit is used to change the DC generated by the vehicle's alternator to the AC required by the teletypewriters. In this type of installation, a larger-than-normal alternator is fitted to the vehicle to generate the amperes necessary to handle the extra load.

1-22. Using Gasoline-Powered DC Generator

a. Tactical mobile teletypewriter equipment operating in a fixed location for long periods of time should be powered by trailer-mounted, gasoline-powered, DC generator sets. Using a separate generator prevents excessive wear on the vehicle's engine and electrical system.

b. The DC generator output terminal polarity must match that of the vehicle's electrical system. Most vehicles ground the negative terminal of the battery supply. Therefore, the positive terminal of the generator set should be connected to the hot side of the shelter power input connector. In addition, make sure terminal connections are clean and tight when using DC power. Terminals exposed to wet weather tend to corrode quickly. Electrolytic action plus DC current speed up the corrosion. Cover the generator output terminals with a protective coating similar to the coating put on the vehicle battery terminals. A corroded generator terminal can overheat enough to cause a fire.

1-23. Overload Protection

Some field units have reported that the circuit breakers on their generators trip when shelter heaters and radio transmitters are operated at the same time. A method used to stabilize the voltage on the output circuit of a DC generator set is to install a 24-volt battery across the generator set load terminals.

CHAPTER 2
POWER CABLING PROCEDURES

2-1. Introduction

This chapter contains the working data which has been described in chapter 1.

2-2. Description of Table 2-1

a. Equipment Nomenclature Column. This column lists communications-electronic equipment which are considered shelter-mounted and are powered by mobile power generator sets.

b. Technical Manual Column. This column identifies the operator's technical manual for the equipment listed in the equipment nomenclature column. These manuals provide installation instructions for the equipment. Power installation instructions in the technical manuals are supplemented by information in this technical bulletin designed to alert you to where electrical hazards exist and to enable you to prevent them.

c. Power Required Column. The data in this column is extracted from the technical characteristics paragraph in the referenced technical manuals. In some instances, the power consumption of the equipment is not listed in the associated technical manual. In this case, the entry in the KW column is the maximum power rating of the engine generator recommended for use with the equipment. The Volts and Freq columns identify the voltage and frequency requirements of the equipment. Refer to this column and equipment data plates when setting generator set voltage/phase selector switches or voltage reconnection boards to match equipment. The phase and number of wires columns serve to identify the type of power required. The information in these columns may be used to select an MEP standard generator which can safely handle the equipment load (table C-1 of appendix C). The number of wires used is extracted from the technical characteristics paragraph of the applicable technical manuals and from engineering drawings of the cables specified for the equipment. These drawings are provided for reference in appendix B of this technical bulletin.

d. Power Generation Equipment Used Column. This column lists the recommended power units/plants required to power the equipment and identifies the generator set(s) used as part of each. A power unit/plant is an assemblage of generator set(s) and trailer(s) equipped with a full complement of ground rods, tools, and accessories needed for generation of electrical power in the field. Information on generator set output connections and adjustments are found in the generator set technical manuals listed in table C-1.

e. Cable Nomenclature Column. This column lists the prime power cable (that carries power directly from the generator to the equipment). The cables were identified from equipment technical manuals and associated engineering documentation. Where cables have not been assigned a nomenclature, the procurement drawing document number is given.

f. Cable Data Column. This column lists the figure reference in appendix B which is the technical engineering drawing for the specific power cable.

g. Generator Hookup Column. This column identifies, by figure number, the applicable generator set hookup diagram. These diagrams highlight pertinent areas on both the generator set and the shelter/equipment. The information in these illustrations may be combined with the generator set and equipment technical manuals to provide complete wiring details, if required. The cable installation and the EGC wire are the only features of these diagrams unique to this manual.

Table 2-1. Generator to Equipment Hookup Data.

Equipment Nomenclature	Technical Manual	Power Required					Power Generation Equipment Used	Cable Nomenclature	Cable Data	Generator Hookup
		KW	Volts	Freq	Phase	Wires [a]			Figure	Figure
AN/ASM-189	TM 11-4940-215	30	120	60	3(Y)	4	PU-551 MEP006GA	SM-D-593252	B-1	2-35
AN/ASM-189A	TM 11-4940-246-14	30	120	60	3(Y)	4	PU-551 MEP006A	SM-D-593252	B-1	2-35
AN/ASM190A	TM 11-4940-246-14	30	120	60	3(Y)	4	PU-551 MEP006GA	SM-D-593535	B-1	2-35
AN/GLQ-3B	TM 11-5865-223-10	10	120	400	3(Y)	4	PU-345 MEP023A	LM91103672 (RL260)	B-27	2-31
AN/GMD 1	TM 11-6660-206-12	1	120	60	1	2	N/A MEP015SA	CX-2043	B-2	2-7
AN/GRC-41	TM11-621	3	120	60	1	2	PU-617 MEPO16A	CX-2254	B29	2-11
AN/GRC-50A	TM 11-5820-461-12	10	120	60	1	2	PU-619 MEPO18A	CX-4686/U	B-3	2-4
							AN/MJQ-18 MEP003A	CX-4686/U	B3	
AN/GRC-98	TM 11-5895338-15	10	120	60	1	2	PU-619 MEP018A	CO-316	B4	2-5
							AN/MJQ-18 MEP003A	CO316	B-4	
AN/GRC-122		5	120	60	1	2	PU-620 MEP017A	CX-10951/G	B-5	2-9
							AN/MGQ16 MEP002A	CX-10951/G	B-5	
AN/GRC-122A,B	TM 11-5815-334-10	5	120	60	1	2	PU-620 MEP017A	CX-10951/G	B-5	2-9
							AN/MJQ-16 MEP002A	CX-10951/G	B-5	

[a] The number of conductors listed in this column does not include the equipment grounding conductor (EGC).

Table 2-1. Generator to Equipment Hookup Data (Continued).

Equipment Nomenclature	Technical Manual	Power Required					Power Generation Equipment Used	Cable Nomenclature	Cable Data	Generator Hookup
		KW	Volts	Freq	Phase	Wires [a]			Figure	Figure
AN/GRC-142	TM 11-5815-334-10	5	120	60	1	2	PU-620 MEP017A	CX-10951/G	B-5	2-9
							AN/MJQ-16 MEP002A	CX-109511G	B-5	
AN/GRC-142A	TM 11-5815-334-10	5	120	60	1	2	PU-20 MEP017A	CX-10951/G	B-5	2-9
							AN/MJQ-16 MEP002A	CX-10951/G	B-5	2-9
AN/GRC-142B	TM 11-5815-334-10	5	120	60	1	2	PU-620 MEP017A	CX-10951/G	B-5	2-9
							AN/MJQ-16 MEP002A	CX-10951/G	B-5	
AN/GSQ-80	TM 11-5895365-15	1.5	120	60	1	2	PU-619 MEP018A	CX-7453/U	B-6	2-1
								CX-7705tU (Stub)	B-7	
AN/MCC-3	TM 11-5805286-15	5	120	60	1	2	PU-620 MEP017A	CX-7453/U	B-6	2-1
								CX-7705/U (Stub)	B-7	
AN/MCC-6	TM 11-5805-285-15	10	120	60	1	2	PU-19 MEP018A	CX-7453/U	B-6	2-1
								CX-7705/U (STUB)	B-7	
AN/MGC-9	TM 11-5815-210-15	10	120	60	1	2	PU-619 MEP018A	CX-7453/U	B-6	2-1
								CX-7705/U (Stub)	B-7	

a The number of conductors listed in this column does not include the equipment grounding conductor (EGC).

Table 2-1. Generator to Equipment Hookup Data (Continued).

Equipment Nomenclature	Technical Manual	Power Required					Power Generation Equipment Used	Cable Nomenclature	Cable Data	Generator Hookup
		KW	Volts	Freq	Phase	Wires[a]			Figure	Figure
AN/MGC-17	TM 11-5815-205-14	3	120	60	1	2	PU-617 MEP016A	CX-4694/U	B-8	2-11
								CX-4693C/U (Stub)	B-9	
AN/MGC-19	TM 11-5895-222-14	10	120	60	1	2	PU-619 MEP018A	CX-7453/U	B-6	2-1
								CX-7705/U (Stub)	B-7	
AN/MGC-19A	TM 11-5895-1048-13	10	120	60	1	2	PU-619 MEPO18A	CX-7453/U	B-6	2-1
								CX-7705/U (Stub)	B-7	
AN/MGC-22	TM 11-5815-307-15	60	120	60	1	2	PU-650 MEP105A	CX-7453/U	B-6	2-10
								CX-7705/U (Stub)	B-7	
AN/MGC-23	TM 11-5815308-15	60	120	60	1	2	PU-650 MEP105A	CX-7453/U	B-6	2-10
								CX-7705/U (Stub)	B-7	
AN/MGC-32	TM 11-5815-309-15	30	120	60	1	2	PU-407 MEP005A	CX-7453/U	B-6	2-10
								CX-7705/U (Stub)	B-7	
AN/MPQ-4A	TM 11-5840-208-10	10	120	400	3(Y)	3	PU-304 MEP023A	CX-2771/U	B-10	2-13
AN/MRC-69,69A	TM 11-5820-204-15	6	120	60	1	2	PU-619 MEP018A	CX4694C/U	B-8	2-12
								CX4693C/U (Stub)	B-9	
							AN/MJQ-18 MEP003A	CX4694C/U	B-8	
								CX4693C/U (Stub)	B-9	

[a]The number of conductors listed in this column does not include the equipment grounding conductor (EGC).

Table 2-1. Generator to Equipment Hookup Data (Continued).

Equipment Nomenclature	Technical Manual	Power Required					Power Generation Equipment Used	Cable Nomenclature	Cable Data	Generator Hookup
		KW	Volts	Freq	Phase	Wires [a]			Figure	Figure
AN/MRC-73( )/U	TM 11-5895-221-14	6	120	60	1	2	PU-619 MEP018A	CX-7453/U	B-6	2-1
								CX-7705/U (Stub)	B-7	
AN/MRC-102	TM 11-5895-357-14-2	6	120	60	1	2	PU-619 MEP018A	CX-7453/U	B-6	2-1
								CX-7705/U (Stub)	B-7	
AN/MRC-103	TM 11-5820-533-14	6	120	60	1	2	PU-619 MEP018A	CX-7453/U	B-6	2-1
								CX-7705/U (Stub)	B-7	
AN/MRC-126	TM 11-5895-694-14	2	120	60	1	2	N/A MEP015A	CX-7453/U	B-6	2-14
								CX-7705/U (Stub)	B-7	
AN/MRC-127	TM 11-5895-694-14	2	120	60	1	2	N/A MEP015A	CX-7453/U	B-6	2-14
								CX-7705/U (Stub)	B-7	
AN/MRT-9	TM 11-5820352-15	6	240	60	1 (split)	3	PU-619 MEP018A	CX-7453/U	B-6	2-15
								CX-7705/U (Stub)	B-7	
AN/MSC-29	TM 11-5895-205-15	12	120	60	1	2	PU-619 MEPO18A	CX-4694C/U	B-8	2-12
								CX-4693C/U (Stub)	B-9	
							AN/MJQ-18 MEP003A	CX-4694C/U	B-8	
								CX-4693C/U (Stub)	B-9	

[a] The number of conductors listed in this column does not include the equipment grounding conductor (EGC).

Table 2-1. Generator to Equipment Hookup Data (Continued).

Equipment Nomenclature	Technical Manual	Power Required					Power Generation Equipment Used	Cable Nomenclature	Cable Data Figure	Generator Hookup Figure
		KW	Volts	Freq	Phase	Wires [a]				
AN/MSC-29A	TM 11-5805-312-14	12	120	60	1	2	PU-619 MEP018A	CX-4694C/U	B-8	2-16
								CX-4693C/U (Stub)	B-9	
AN/MSC-31A	TM 11-5895-223-15	3	120	60	1	2	PU-618 MEP017A	CX-7453/U	B-6	2-2
								CX-7705/U (Stub)	B-7	
AN/MSC-32A	TM 11-5895-464-15	6	120	60	1	2	PU-618 MEP017A	CX-7453/U	B-6	2-1
								CX-7705/U (Stub)	B-7	
AN/MSQ-85	TM 11-5895-692-15	2.5	120	60	1	2	PU-617 MEP016A	SC-C662029	B-11	2-17
								SC-C622028	B-12	
AN/MTC-1	TM 11-5805-284-14	10	120	60	1	2	PU-619 MEP018A	CX-7453/U	B-6	2-1
								CX-7705/U (Stub)	B-7	
AN/MTC-1A	TM 11-5805-284-14	10	120	60	1	2	PU-619 MEP018A	CX-7453/U	B-	2-1
								CX-7705/U (Stub)	B-7	
AN/MTC-3	TM 11-5805-202-15	5	120	60	1	2	PU-618 MEP017A	CX4694C/U	B-8	2-18
								CX-4693C/U (Stub)	B-9	
							AN/MJQ-16 MEP002A	CX-4694C/U	B-8	
								CX-4693C/U (Stub)	B-9	

[a] The number of conductors listed in this column does not include the equipment grounding conductor (EGC).

Table 2-1. Generator to Equipment Hookup Data (Continued).

Equipment Nomenclature	Technical Manual	Power Required					Power Generation Equipment Used	Cable Nomenclature	Cable Data	Generator Hookup
		KW	Volts	Freq	Phase	Wires [a]			Figure	Figure
AN/MTC-7	TM 11-5805-211-15	2.5	120	60	1	2	PU-617 MEP016A	CX4694C/U CX4693C/U (Stub)	B-8 B-9	2-19
AN/TCC-60	TM 11-5805-358-14-2	3	120	60	1	2	PU-628 MEP016A	CX-7453/U CX-7705/U (Stub)	B-6 B-7	2-20
AN/TCC-1	TM 11-5805-357-14-2	7	120	60	1	2	PU-629 MEP017A	CX-7453/U CX-7705/U (Stub)	B-6 B-7	2-1
AN/TCC62	TM 11-5805-359-14	10	120	60	1	2	PU-629 MEP017A	CX-7453/U CX-7705/U (Stub)	B-6 B-7	2-1
AN/TCC-5	TM 11-5805-371-14-2	3	120	60	1	2	PU-628 MEP016A	CX-7453/U CX-7705/U (Stub)	B-6 B-7	2-1
AN/TCC69	TM 11-5805-358-14-2	3	120	60	1	2	PU-628 MEPO16A	CX-7453/U CX-7705/U (Stub)	B-6 B-7	2-20
AN/TCC-72	TM 11-5805-479-14-2	10	120	60	1	2	PU-628 MEP016A	CX-7453/U CX-7705/U (Stub)	B-6 B-7	2-20
AN/TCC-73(V)1	TM 11-5805-585-14-2	6.2	120	60	1	2	PU-629 MEP017A	CX-7453/U CX-7705/U (Stub)	B-6 B-7	2-1

[a] The number of conductors listed in this column does not include the equipment grounding conductor (EGC).

Table 2-1. Generator to Equipment Hookup Data (Continued).

Equipment Nomenclature	Technical Manual	Power Required					Power Generation Equipment Used	Cable Nomenclature	Cable Data	Generator Hookup
		KW	Volts	Freq	Phase	Wires [a]			Figure	Figure
AN/TCC-73(V)2	TM 11-5805-585-14-2	6.2	120	60	1	2	PU-629 MEP017A	CX-7453/U CX-7705/U (Stub)	B-6 B-7	2-1
AN/TGC-30	TM 11-5815-361-14	3	120	60	1	2	PU-628 MEP016A	CX-7453/U CX-7705/U (Stub)	B-6 B-7	2-20
AN/TKQ-1	TM 11-5840-262-12	10	120	400	3(Y)	3	PU-375 MEP023A	CX-1 1081/U	B-13	2-21
AN/TKQ-2	TM 11-5840-294-12	10	120	400	3(Y)	3	PU-375 MEP023A	CX-11081A/U	B-13	2-21
AN/TLQ-15	TM 11-5895-372-10	10	120	400	3(Y)	4	PU-684 MEP023A	RL-260	B-28	2-32
AN/TRC-29	TM 11-689	2.3	120	60	1	2	PU-619 MEP018A AN/MJQ-18 MEP003A	CX-2440/U CX-2440/U	B-15 B-15	2-23
AN/TRC39	TM 11-689	6.8	120	60	1	2	PU419 MEP018A AN/MJQ-18 MEP003A	CX-2440/U CX-2440/U	B-15 B-15	2-23
AN/TRC-68	TM 11-5820-222-10	.5	120	60	1	2	N/A MEP014A	CX-4481	B-24	2-6
AN/TRC-68A	TM 11-5820-222-10	.5	120	60	1	2	N/A MEP014A	CX-4881	B-24	2-6
AN/TRC-108	TM 11-5895-367-14	3.46	120	60	1	2	PU-626 MEPO16A	CX-7453/U CX-7705/U (Stub)	B6 B-7	2-20

[a] The number of conductors listed in this column does not include the equipment grounding conductor (EGC).

Table 2-1. Generator to Equipment Hookup Data (Continued).

Equipment Nomenclature	Technical Manual	Power Required					Power Generation Equipment Used	Cable Nomenclature	Cable Data	Generator Hookup
		KW	Volts	Freq	Phase	Wires [a]			Figure	Figure
AN/TRC-109	TM 11-5820-536-15	4	120	60	1	2	PU-626 MEPO16A	CX-7453/U CX-7705/U (Stub)	B-6 B-7	2-20
AN/TRC-110	TM 11-5820-535-15	7.380	120	60	1	2	PU-618 MEP017A	CX-7453/U CX-7705/U (Stub)	B-6 B-7	2-2
AN/TRC-111	TM 11-5820-546-15	5.142	120	60	1	2	PU-631 MEP017A	CX-7453/U CX-7705/U (Stub)	B-6 B-7	2-2
AN/TRC-112[c]	TM 11-5820-556-15	10	120/ 208	60	1 (split)	4	PU-332 MEP018A AN/MJQ-18 MEP03A	SC-D630304 SC-D-630304	B16 B-16	2-24
AN/TRC-113	TM 11-5820-562-14	4.8	120	60	1	2	PU-625 MEPO16A	CX-7453/U CX-7705/U (Stub)	B-6 2-20 B-7	
AN/TRC-117	TM 11-5895-366-14-2	6.56	120	60	1	2	PU-618 MEP017A	CX-7453/U CX-7705/U (Stub)	B-6 2-2 B-7	
AN/TRC-121	TM 11-5820-602-15	17.4	240	60	1 (split)	4	PU-405 MEP004A	SC-D602436	B-17	2-25
AN/TRC-133A	TM 11-5820-610-14	3.145	120	60	1	2	PU-659 MEP018A	CX-7453/U CX-7705/U (Stub)	B-6 2-1 B-7	

[a] The number of conductors listed in this column does not include the equipment grounding conductor (EGC).
[C] Supplied with auxiliary generator power transfer switch in addition to one on generator trailer.

Table 2-1. Generator to Equipment Hookup Data (Continued).

Equipment Nomenclature	Technical Manual	Power Required					Power Generation Equipment Used	Cable Nomenclature	Cable Data	Generator Hookup
		KW	Volts	Freq	Phase	Wires [a]			Figure	Figure
ANITRC-138	TM 11-5820-773-15	6	120	60	1	2	PU-631 MEP017A	CX-7453U CX-7705/ (Stub)	B-6 B-7	2-1
AN/TRC-145	TM 11-5895-453-14-2	4.304	120	60	1	2	PU-625 MEP016A	CX-7453u CX-7705U (Stub)	B-6 B-7	2-20
AN/TRC-151	TM 11-5820-894-14	3 5	120	60	1	2	PU-618 MEP017A	CX-7453/U CX-7705/U (Stub)	B-6 B-7	2-1
ANITRC-152	TM 11-582-769-14	3.5	120	60	1	2	PU-618 MEP017A	CX-7453/U CX-7705/U (Stub)	B-6 B-7	2-1
AN/TRQ23	TM 11-5825-242-10	5	120	60	1	2	N/A MEP014A	CX-11948	B-18	2-26
AN/TRQ32	TM 11 -5895-022-24	5	120	60	1	2	PU-618 MEP017A	CX-7453/U CX-7705U (Stub)	B-6 B-7	2-1
AN/TSC-26	TM 11-5895482-12	30	120	60	3(Y)	4	PU-407 MEP005A	CX-11284 CX-11283 (Stub)	B-20 B19	2-29
		60	120	60	3(Y)	4	PU-650 MEP105A	CX-11285 CX-11283 (Stub)	B-20 B-19	2-28
AN/TSC-54	TM 11-5895-389-12	60	120	400	3(Y)	4	PU-708 MEP115A	CX-10467	B-21	2-30

[a] The number of conductors listed in this column does not include the equipment grounding conductor (EGC).

Table 2-1. Generator to Equipment Hookup Data (Continued).

Equipment Nomenclature	Technical Manual	Power Required					Power Generation Equipment Used	Cable Nomenclature	Cable Data	Generator Hookup
		KW	Volts	Freq	Phase	Wires [a]			Figure	Figure
AN/TSC-58	TM 11-5895-574-15	7.17	120	60	1	2	PU-619 MEP018A	CX-7453/U CX-7705/U (Stub)	B-6 B-7	2-1
AN/TSC-85	TM 11-5895-845-14	15	120	60	1	2	PU-619 MEP018A AN/MJ-18 MEP003A	SM-D-777226-1 SM-D-777225-1 SM-D-777226-1 SM-D-777225-1		2-33
AN/TSC-93	TM 11-5820-878-14	10	120	60	1	2	PU-619 MEP018A AN/MJQ-18 MEP003A	SM-D-777226-1 SMD-777225-1 SM-D777226-1 SM-D777225-1		2-33
AN/TS-43	TM 11-5895-431-12	60	120/ 208	60	3(Y)	4	PU-407 MEPOO5A	CX-12150/ TSQC43 CX-12160/ TSQ43	B-22 B-23	2-27
ANITSO43A	TM 11-5895-431-12	60	120/ 208	60	3(Y)	4	PU-407 MEPOOSA	CX-12150/ TSQ-43 CX-12160/ TSQ-43	B-22 B-23	2-27
AN/TSQ-71A	TM 11-5895-474-12	10	120	400	3(Y)	3	PU-678 MEP023A	CX-1 2022/U	B-14	2-22

[a] The number of conductors listed in this column does not include the equipment grounding conductor (EGC).

Table 2-1. Generator to Equipment Hookup Data (Continued).

Equipment Nomenclature	Technical Manual	Power Required					Power Generation Equipment Used	Cable Nomenclature	Cable Data	Generator Hookup
		KW	Volts	Freq	Phase	Wires [a]			Figure	Figure
ANTSQ-84	TM 11-5895-799-14	8.1	240	60	1 (split)	3	PU-619[d] MEPO18A	SC-D-861681	B-25	2-3
								SC-D-861646	B-26	
							AN/MJQ-18 MEPO003A	SC-D-861681	B-25	
								SC-D-861646	B-26	
AN/TTC-23	TM 11-5805-391-15	5.126	120	60	1	2	PU-618[b] MEP017A	CX-7453/U	B-6	2-1
								CX-7705/U (Stub)	B-7	
AN/TTC-29	TM 11-5805-582-15	3	120	60	1	2	PU-628[d] MEP016A	CX-7453/U	B-6	2-20
								CX-7705/U (Stub)	B-7	
ANTTC-38	TM 11-5805-628-12	24	120	60	3	4	PU-407 MEP005A	SM-D-744663	B-31	2-8
								SM-D-744664	B-30	
AN'TC-41	TM 11-5805-693-12	5	120	60	1	2	PU-620 MEP017A	CX-7453/U	B6	2-1
								CX-7705/U (Stub)	B-7	
AN/TYC-16	TM 11-5895-1176-10	30	120	60	3(Y)	5	AN/MJQ-10 MEPOOSA	81-28933-001		2-34
SB-675/MSC	TM 11-5895-222-15	11	120	60	1	2	PU-619[d] MEP018A	CX-7453/U	B-6	2-1
								CX-7705/U (Stub)	B-7	

[a] The number of conductors listed in this column does not include the equipment grounding conductor (EGC).
[b] PU-618 is the replacement for PU-294 as used originally. I you have a PU-294 in use with your equipment, refer to generator hookup diagram in figure 2-12.
[c] Supplied with auxiliary generator power transfer switch in addition to one on generator trailer.
[d] Generator power transfer switch used on power unit trailer.

2-3. Generator Hookup Diagrams

The diagrams which follow are used in support of the information provided in table 2-1.

WARNING

Color codes for power cable wire identification should be checked prior to connecting your equipment to a power source. Standard electrical color code may not have been used in your equipment. Refer to your technical manuals before beginning power installation procedures.

WARNING

Do not handle power cables when generator is supplying power to equipment. There may be lethal leakage on cable sheath if ground bonding system is not intact.

CAUTION

Note that the load terminals for single-phase, two-wire service are not the same on all generators. Generators from .5 KW to 3 KW use L1 and L2 as load terminals, and generators from 5 KW up to 10 KW use L2 and L3. Refer to table C-1 in appendix C to identify these generators by nomenclature.

NOTE

In some of the generator hookup diagrams, the Equipment Grouding Conductor (EGC) is shown connected to the neutral output terminal instead of the generator set, or trailer, ground stud. As long as the neutral terminal is bonded to a source of earth ground using an AWG No. 6 wire, this configuration may be used safely. You may choose to do this because, due to its larger size, the neutral terminal occasionally provides a better mechanical connection.

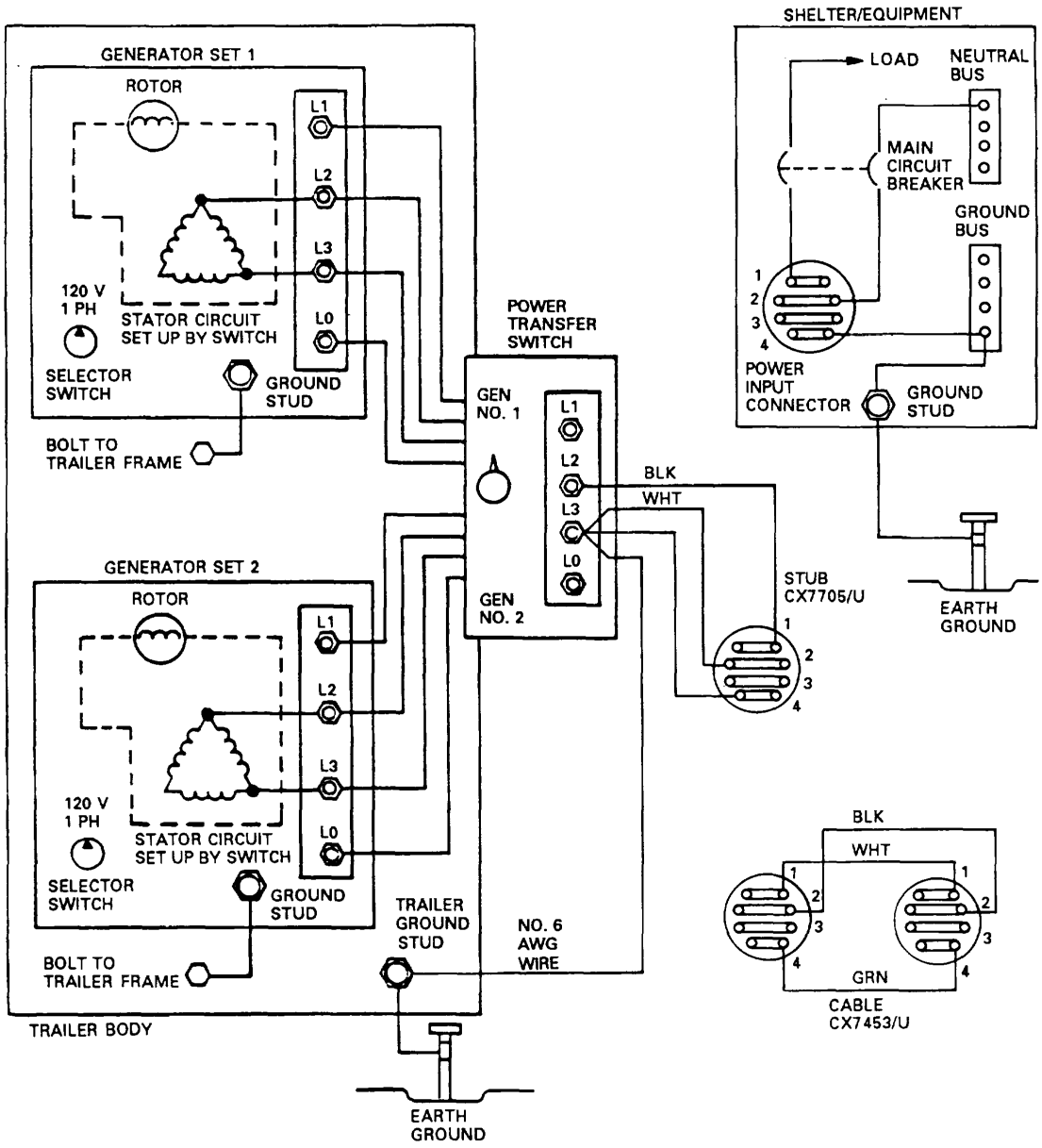


Figure 2-1. Generator Hookup: Two generator units 120 volts, 60 Hz, single-phase ac (CX-7453/U Power Cable and CX-7705/U Stub).

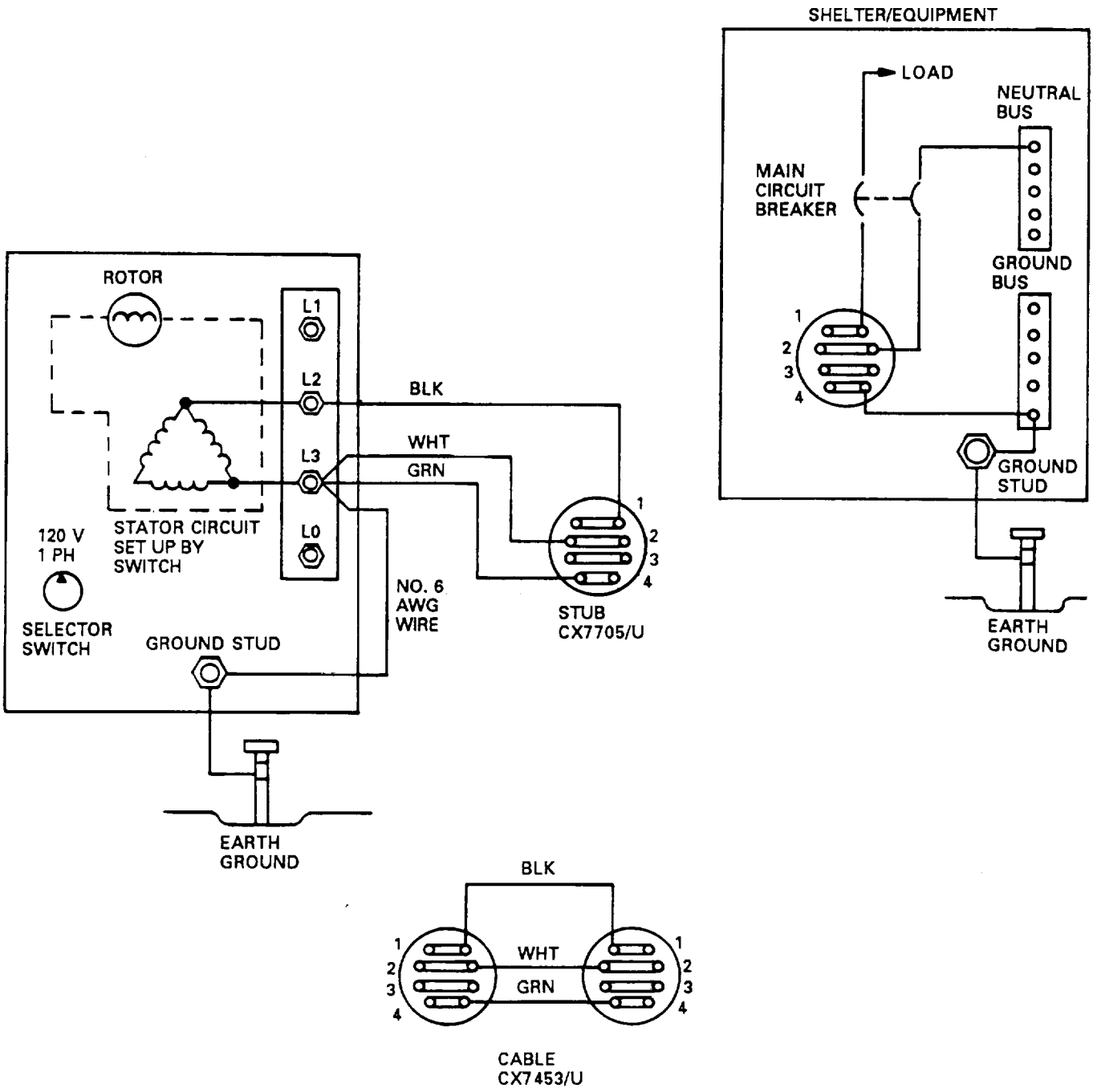


Figure 2-2. Generator Hookup: Single generator unit, 120 volts, 60 Hz, single-phase ac (CX-7453/U Power Cable with CX-7705/U Stub).

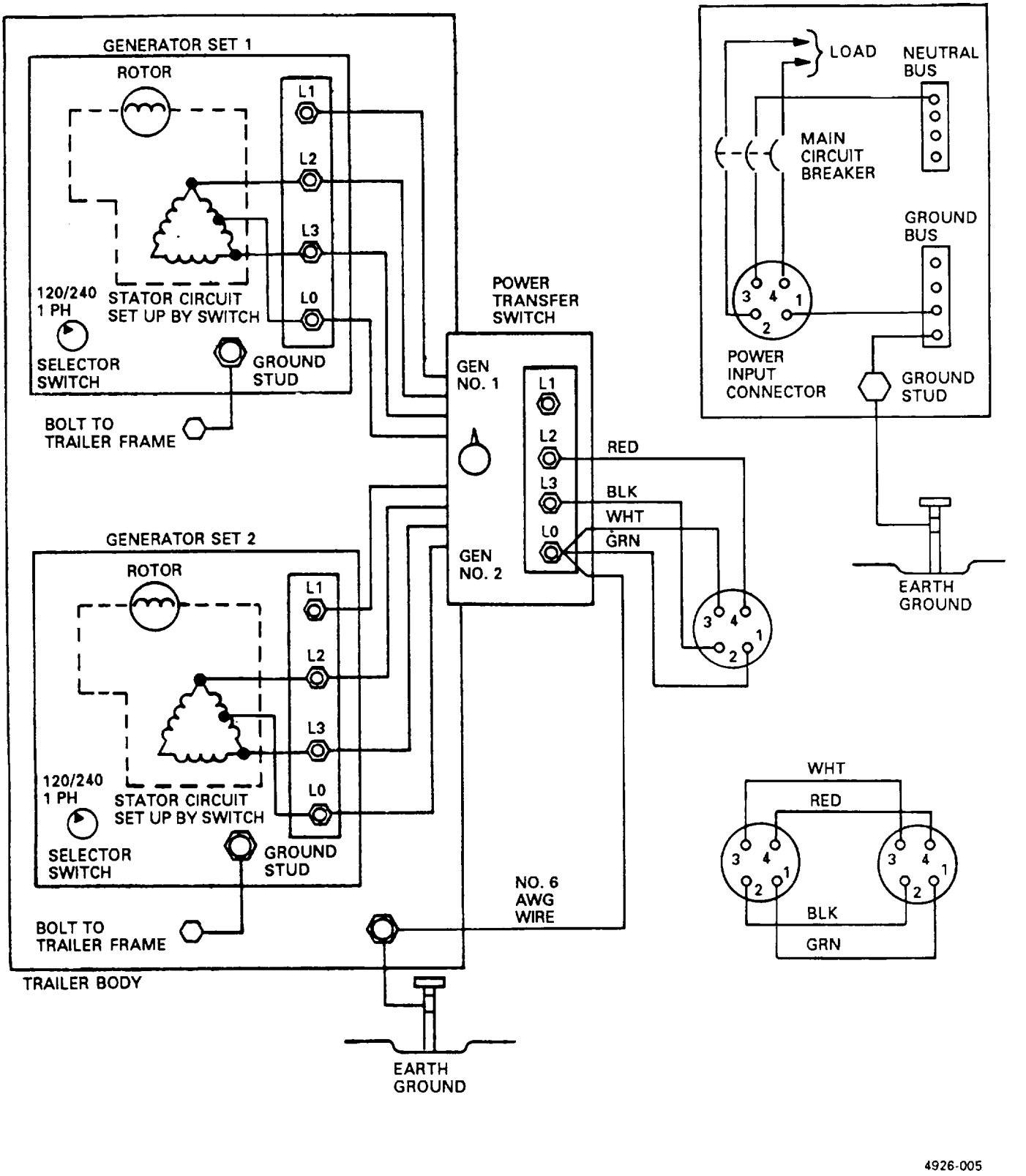
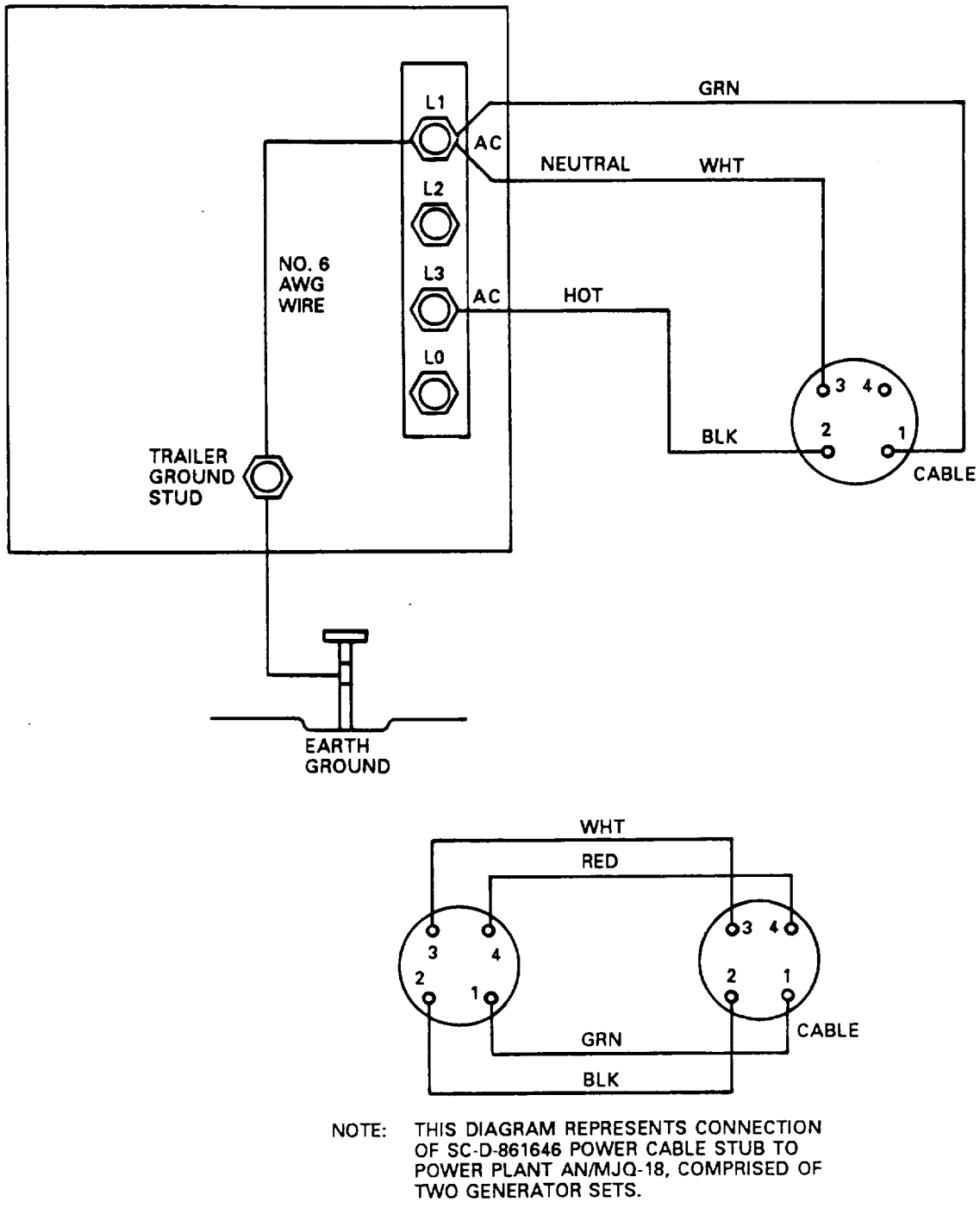


Figure 2-3. Generator Hookup: Two generator units, 240 volts, 60 Hz, split into two 120 volt single-phase ac circuits (SC-D-861681 Power Cable with SC-D-861646 Stub) (Sheet 1 of 2).



NOTE: THIS DIAGRAM REPRESENTS CONNECTION OF SC-D-861646 POWER CABLE STUB TO POWER PLANT AN/MJQ-18, COMPRISED OF TWO GENERATOR SETS.

4926-006

Figure 2-3. Generator Hookup: Two generator units, 240 volts, 60 Hz, split into two 120 volt single-phase ac circuits (SC-D-861681 Power Cable with SC-D-861646 Stub) (Sheet 2 of 2).

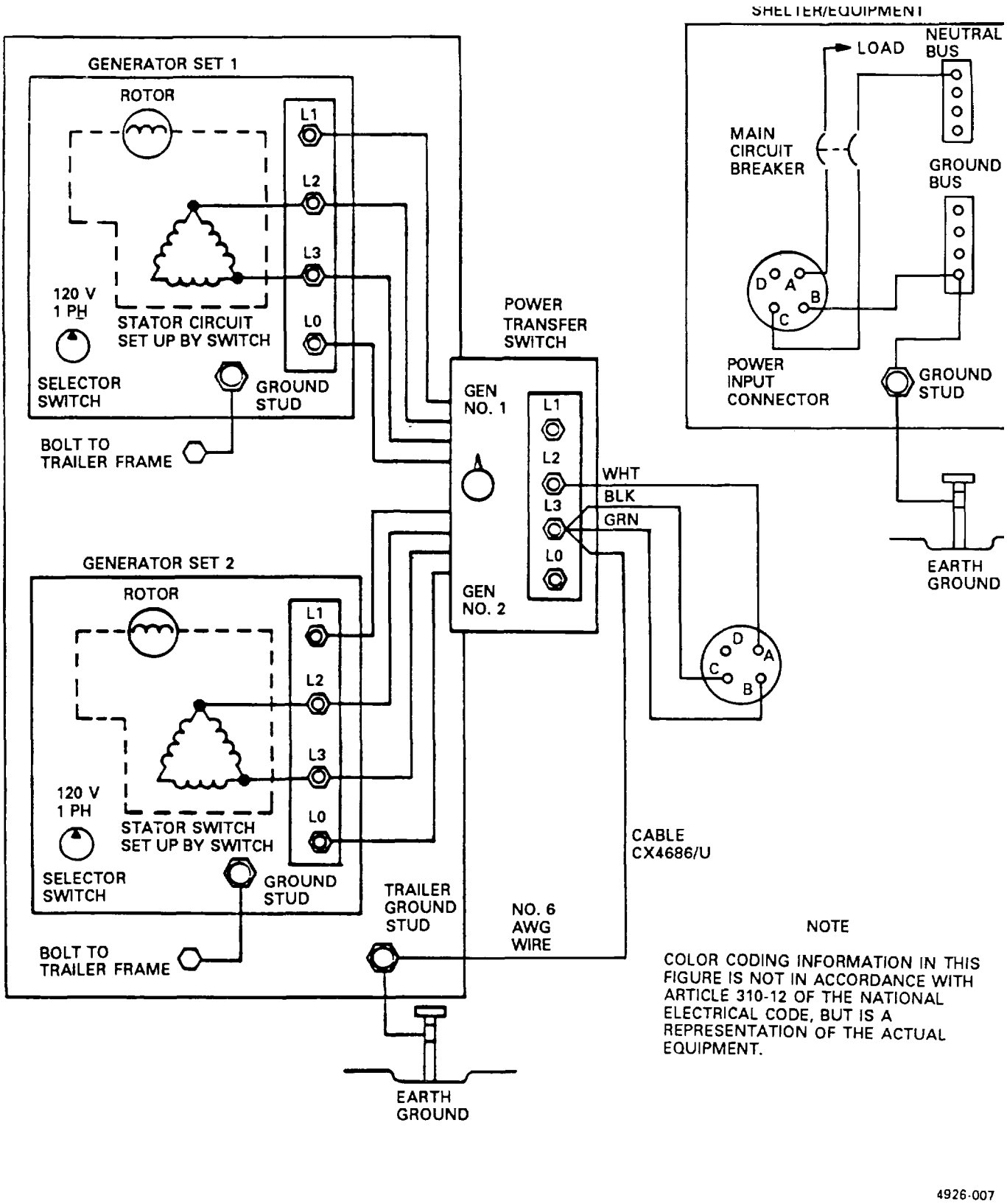
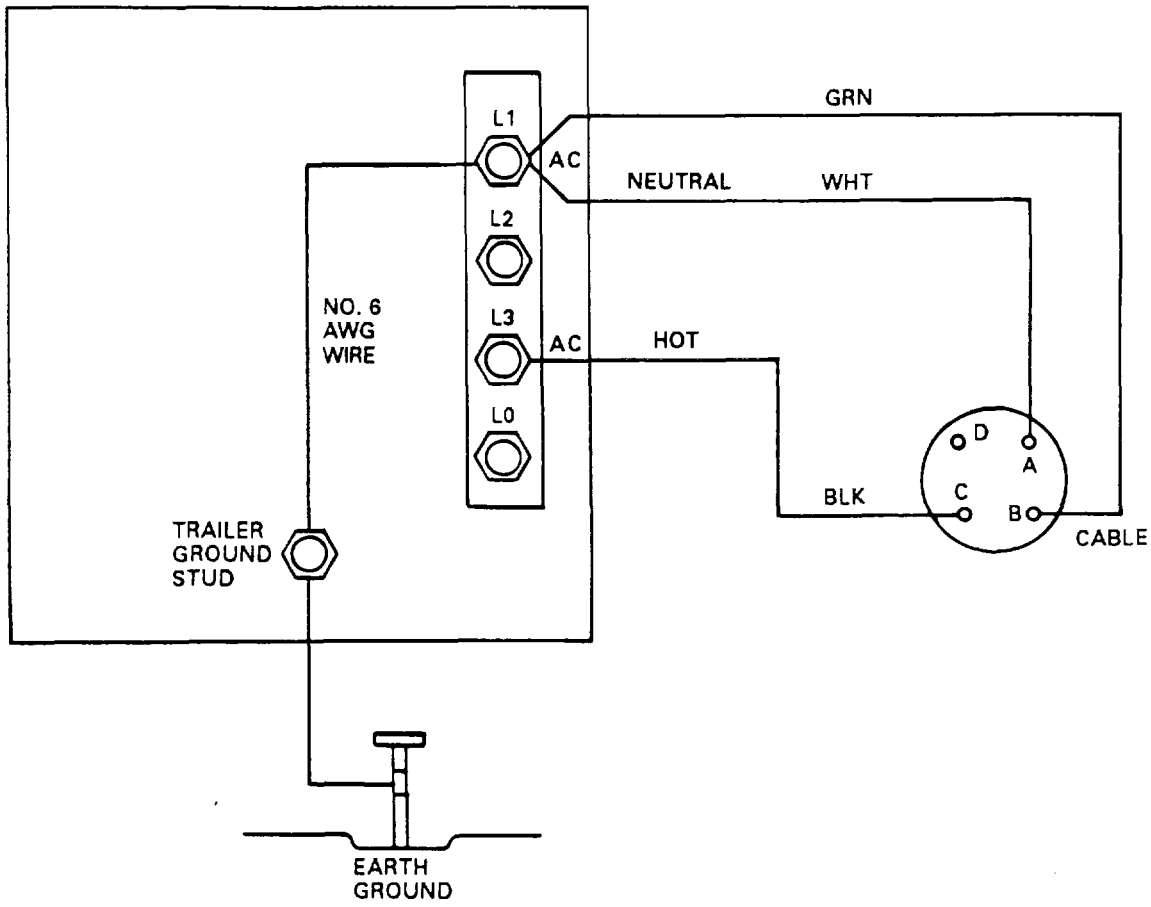


Figure 2-4. Generator Hookup: Two generator units, 120 volts, 60 Hz, single-phase ac (CX-4686/U Power Cable, no stub) (Sheet 1 of 2).



NOTE: THIS DIAGRAM REPRESENTS CONNECTION OF CX-4686/U POWER CABLE TO POWER PLANT AN/MJQ-18, COMPRISED OF TWO GENERATOR SETS.

4926-008

Figure 2-4. Generator Hookup: Two generator units, 120 volts, 60 Hz, single-phase ac (CX-4686/U Power Cable, no stub) (Sheet 2 of 2).

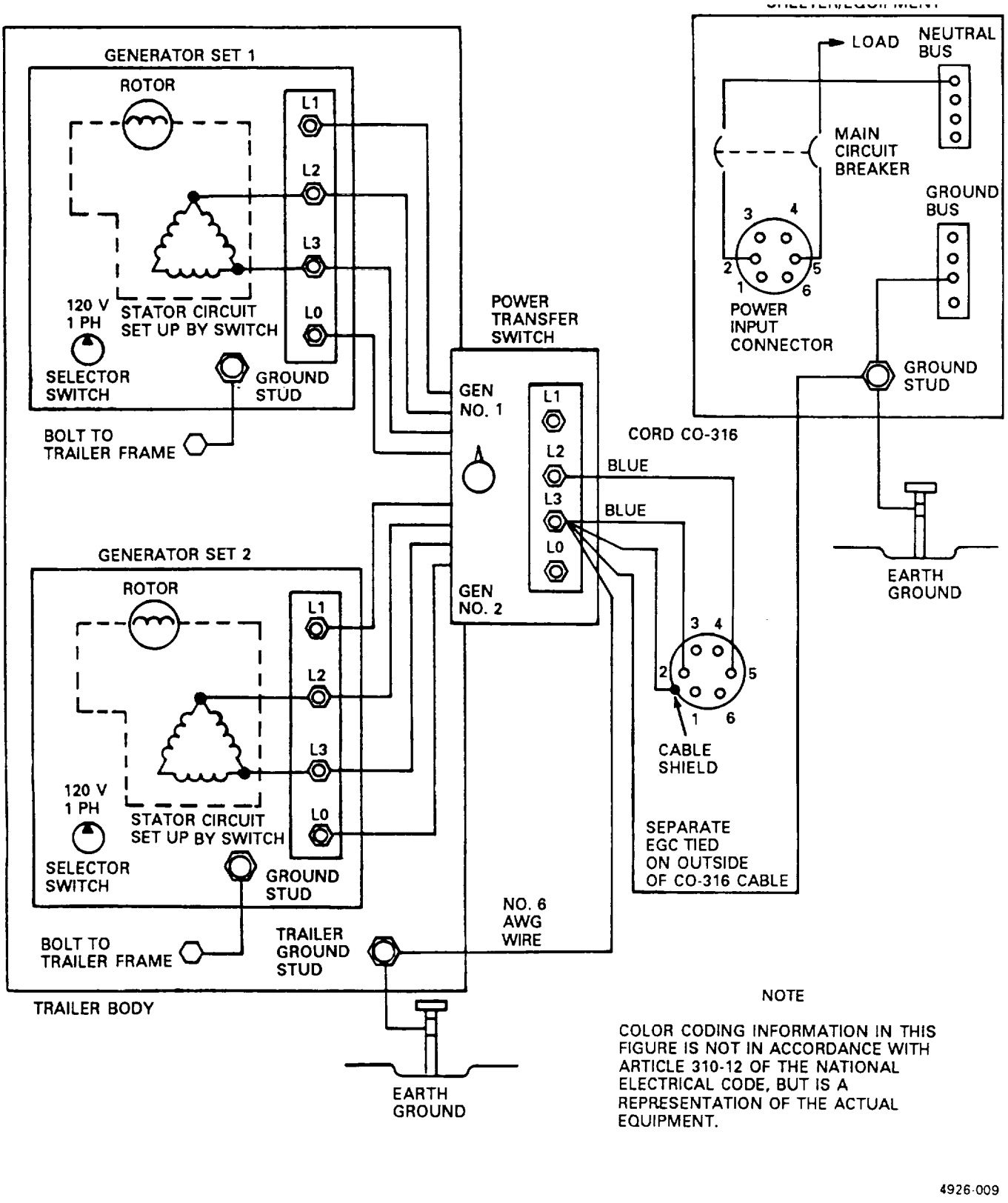
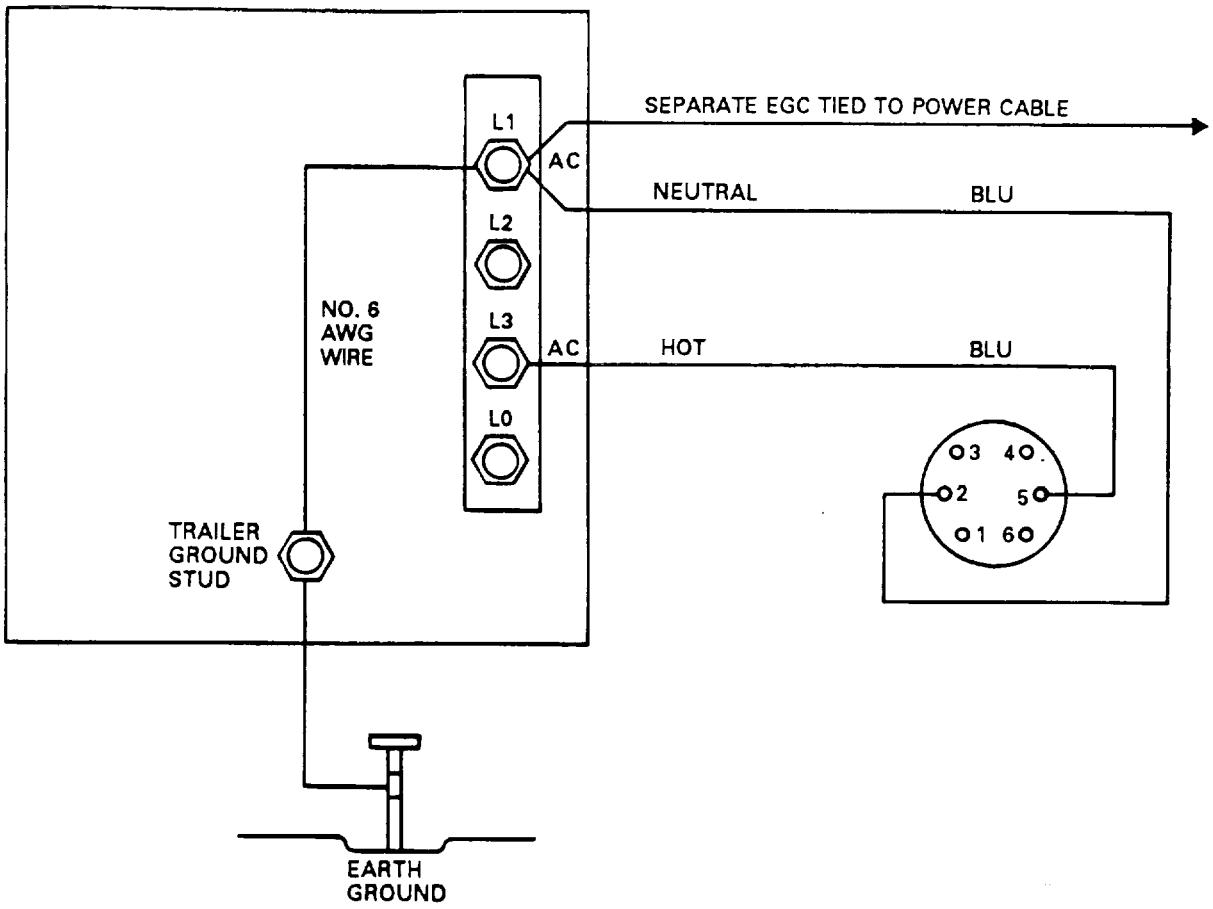


Figure 2-5. Generator Hookup: Two generator units , 120 volts, 60 Hz , single - phase ac (CO-316 Power Cable, no stub) (Sheet 1 of 2).



NOTE: THIS DIAGRAM REPRESENTS CONNECTION OF CO-316 POWER CABLE TO POWER PLANT AN/MJQ-18, COMPRISED OF TWO GENERATOR SETS.

4926-010

Figure 2-5. Generator Hookup: Two generator units, 120 volts, 60 Hz, single-phase ac (CO-316 Power Cable, no stub) (Sheet 2 of 2).

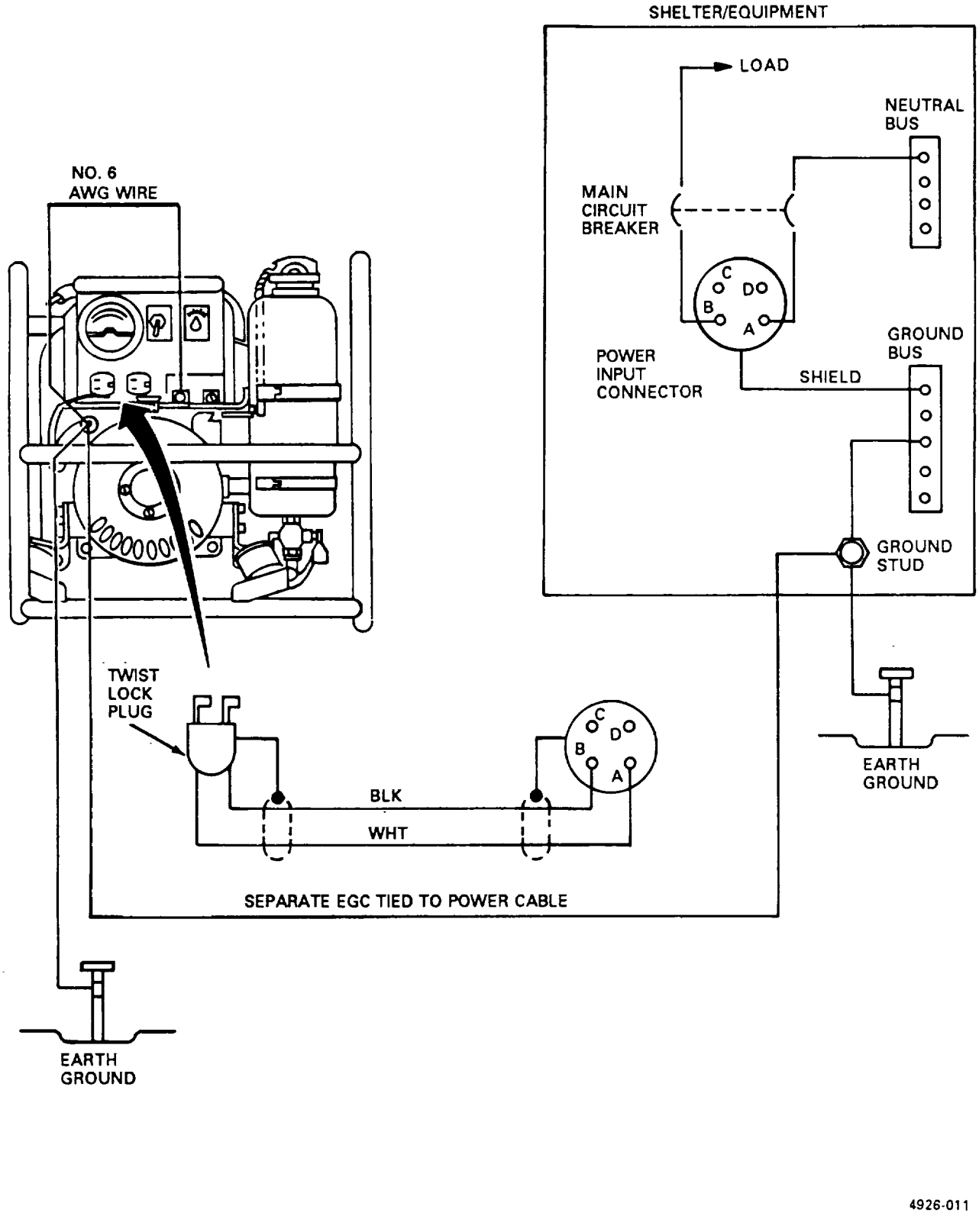
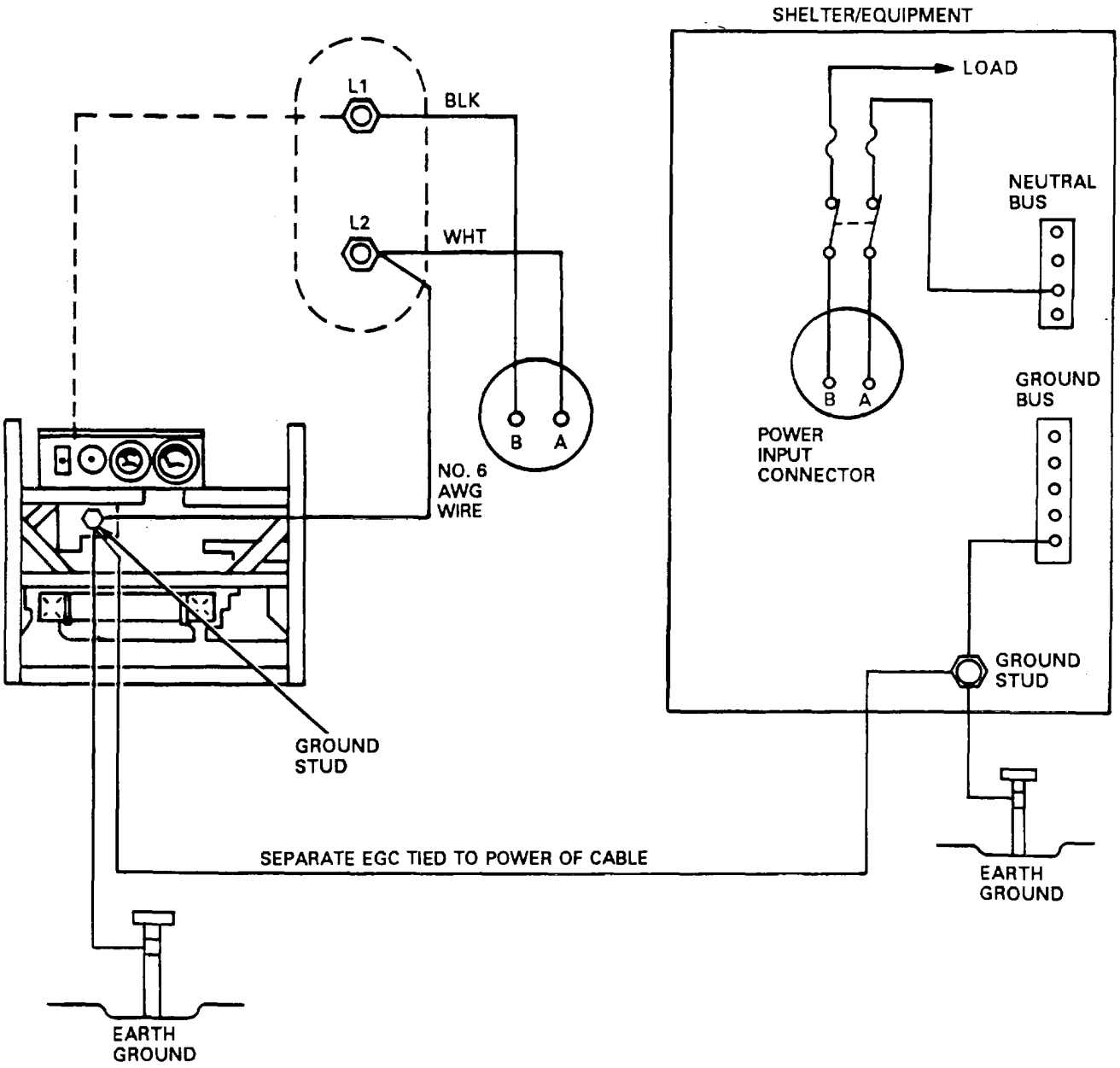


Figure 2-6. Generator Hookup: Single lightweight generator unit, 120 volts, 60 Hz, single-phase ac (CX-4881 Power Cable).



NOTE:

ADD A LENGTH OF NO, 6 AWG GREEN INSULATED WIRE AND
BIND TO OUTSIDE OF CX2043 WITH LACING TWINE. **4926-012**

Figure 2-7. Generator Hookup: Single lightweight generator unit, 120 volts, 60 Hz, single-phase ac (CX-2043 Power Cable).

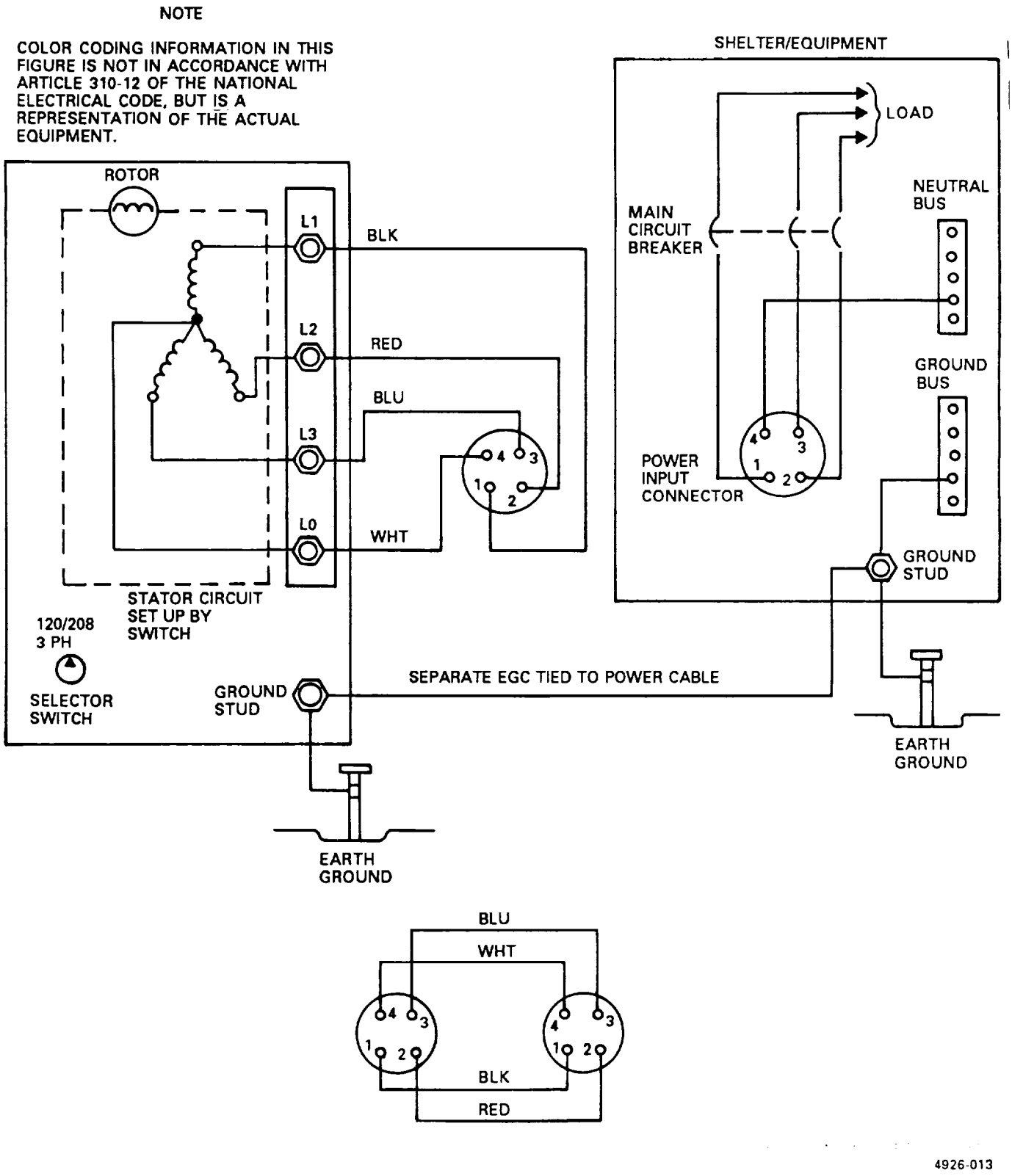


Figure 2-8. Generator Hookup: Single generator unit, 120/208 volts, 60 Hz, three-phase Y, (Cable SM-D-744664 with stub).

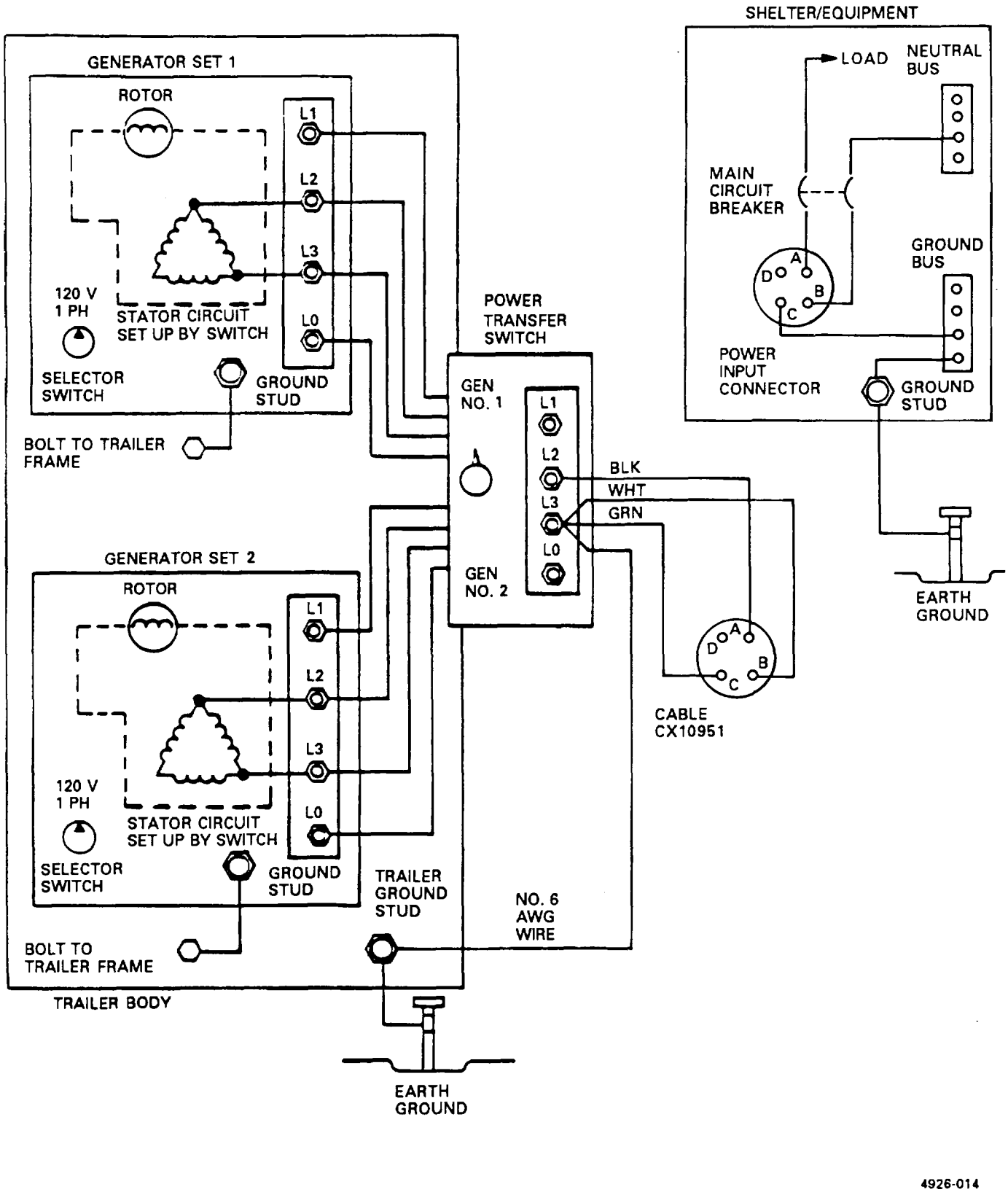
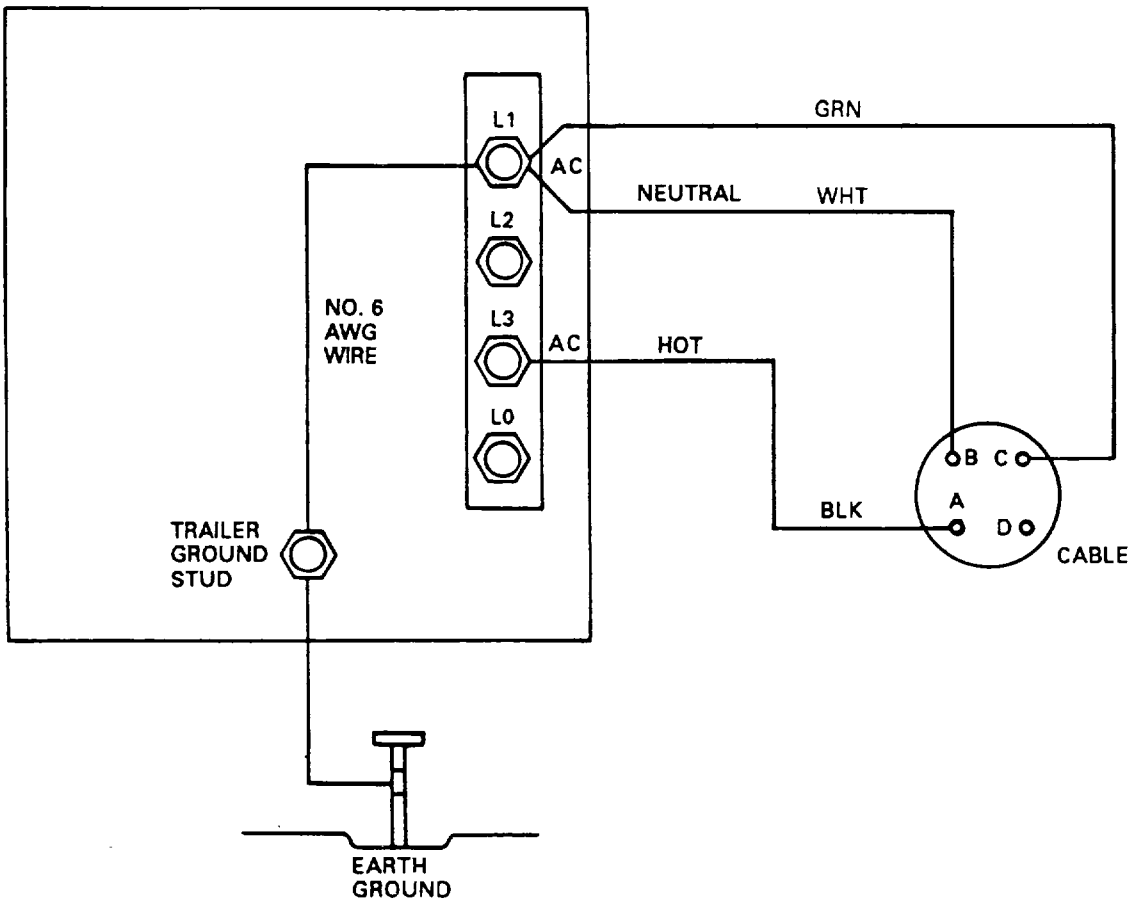


Figure 2-9. Generator Hookup: Two generator units, 120 volts, 60 Hz, single-phase ac (CX- 10951U/G Power Cable) (Sheet I of 2).



NOTE: THIS DIAGRAM REPRESENTS CONNECTION OF CX-10951U/G POWER CABLE TO POWER PLANT AN/MJQ-16, COMPRISED OF TWO GENERATOR SETS.

4926-015

Figure 2-9. Generator Hookup: Two generator units, 120 volts, 60 Hz, single-phase ac (CX- 10951 U/G Power Cable) (Sheet 2 of 2).

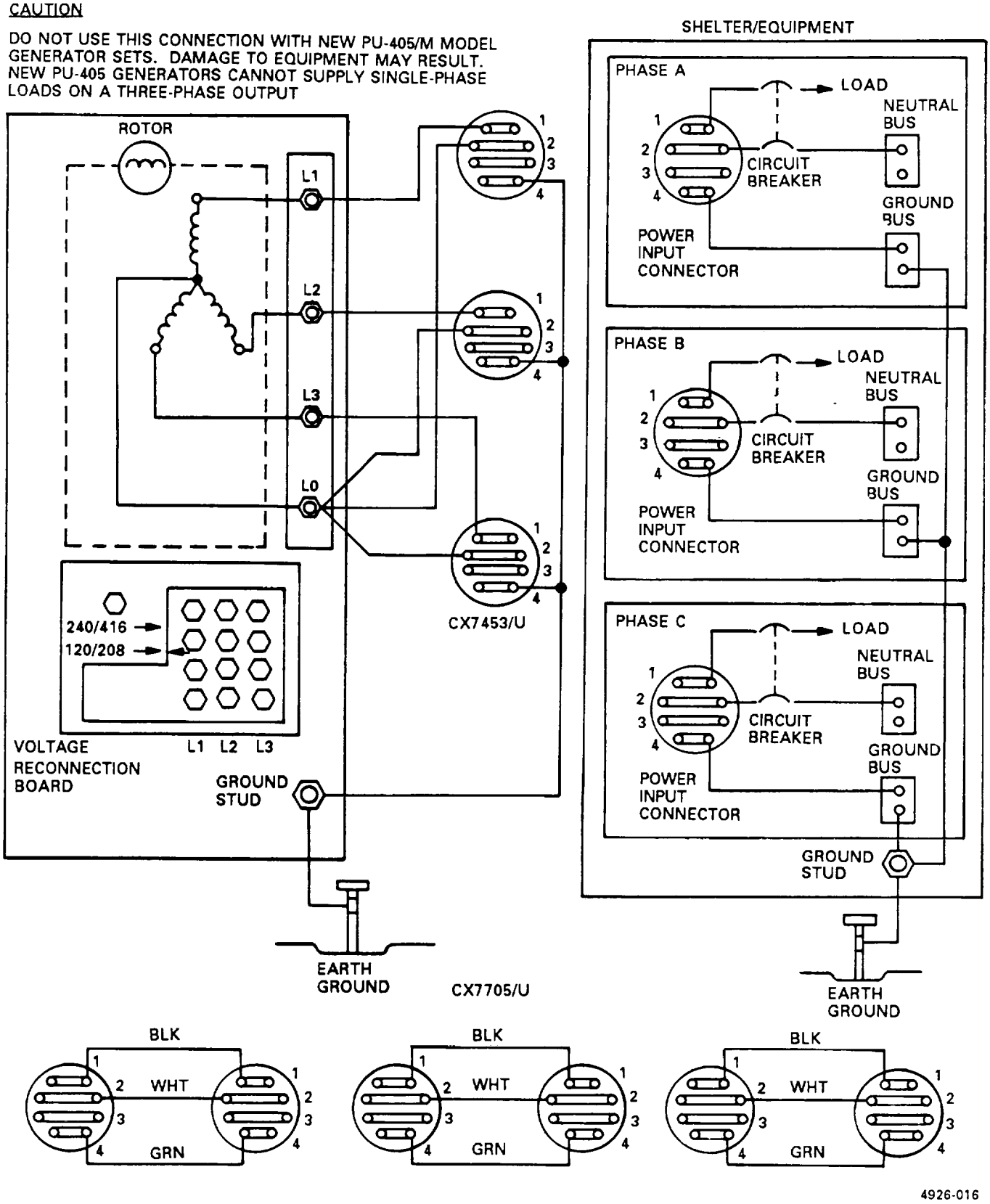


Figure 2-10. Generator Hookup: 30KW generator, single unit 120/208 volts, 60 Hz, three - phase, split into three single-phase circuits (three CX - 7453 Power Cables with three CX - 7705/U Stubs).

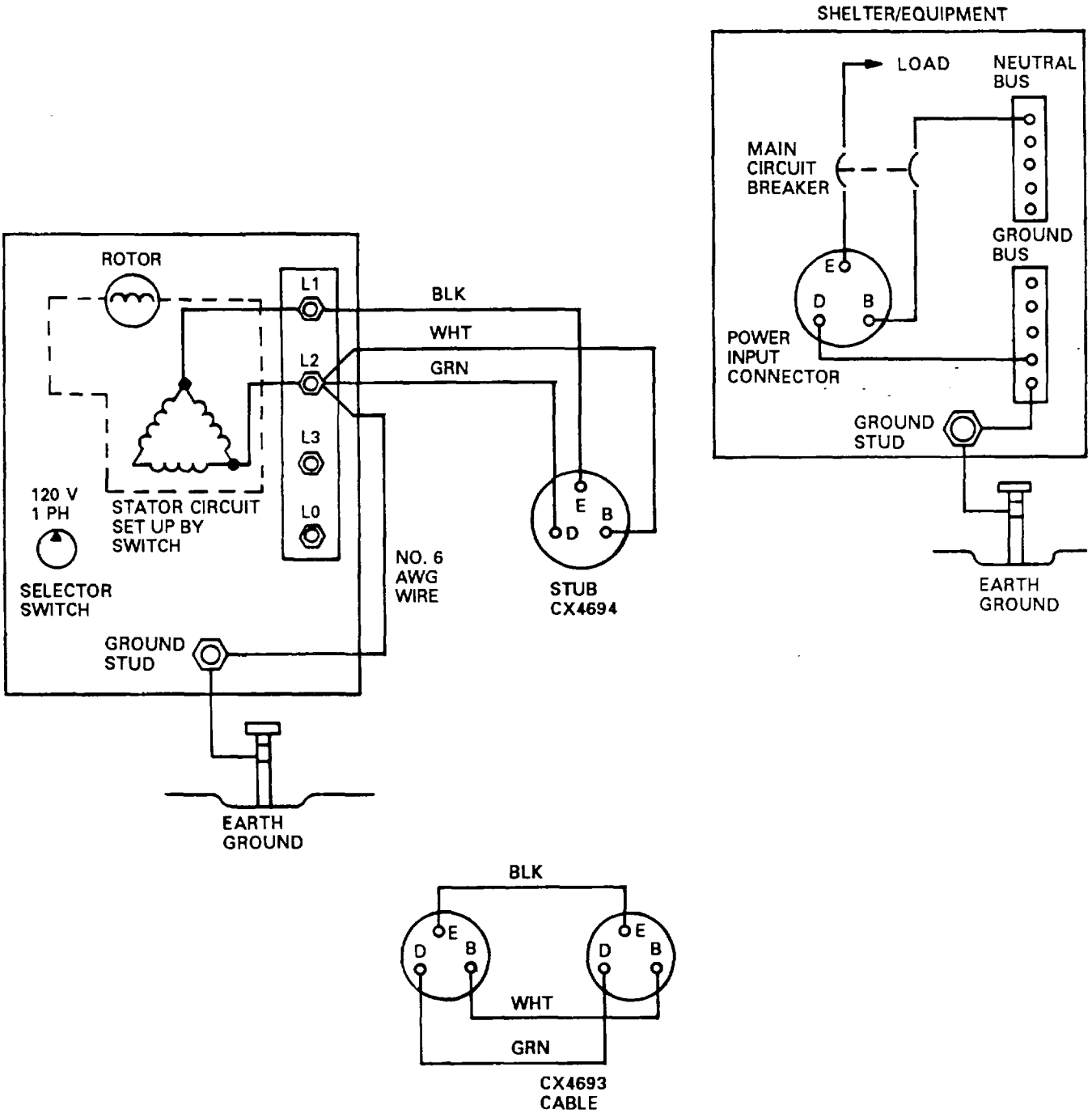


Figure 2-11. Generator Hookup: 3 KW single generator unit, 120 volts, 60 Hz, single-phase ac, (CX-4694C/U Power Cable with CX-4693C/U Stub).

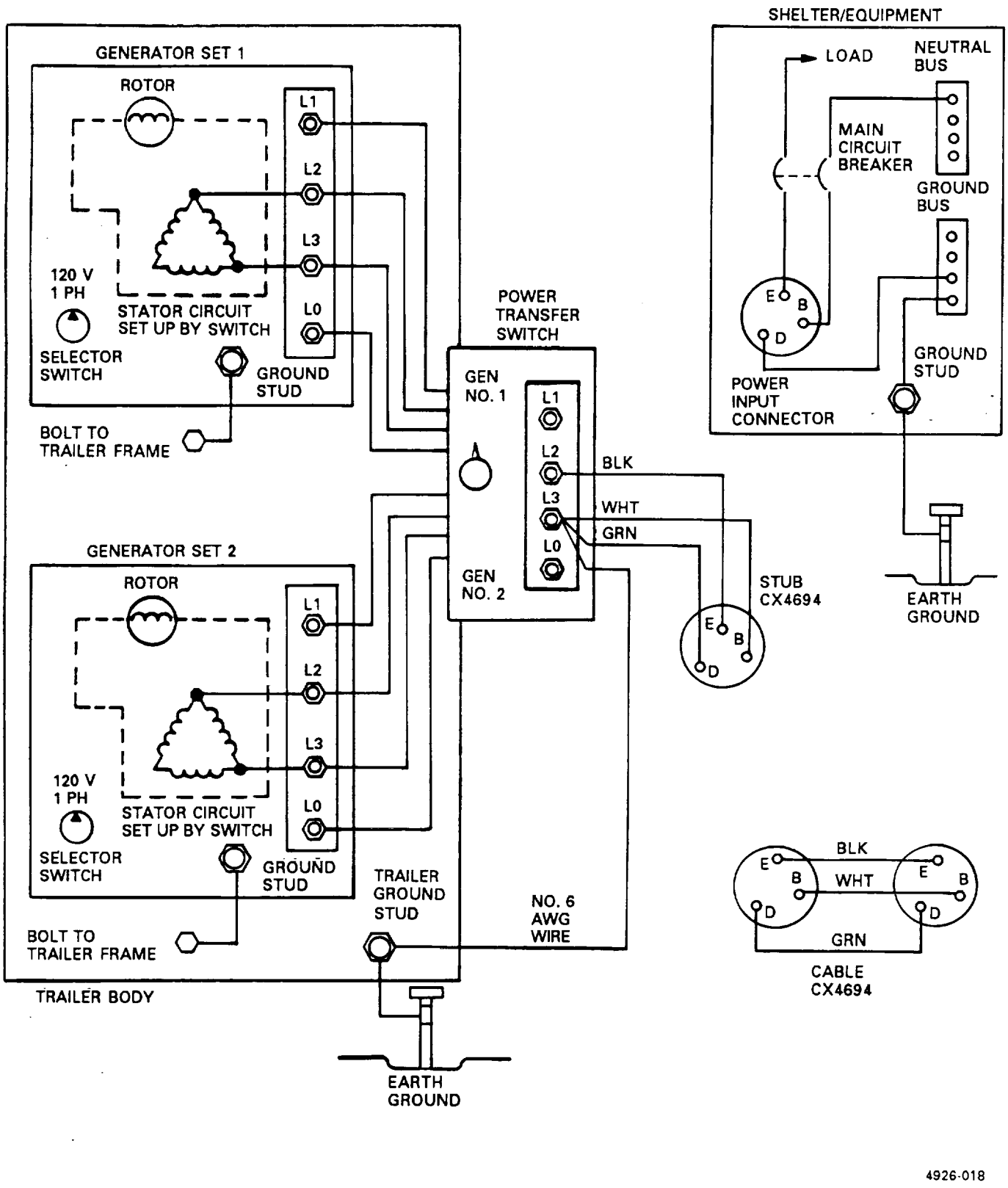
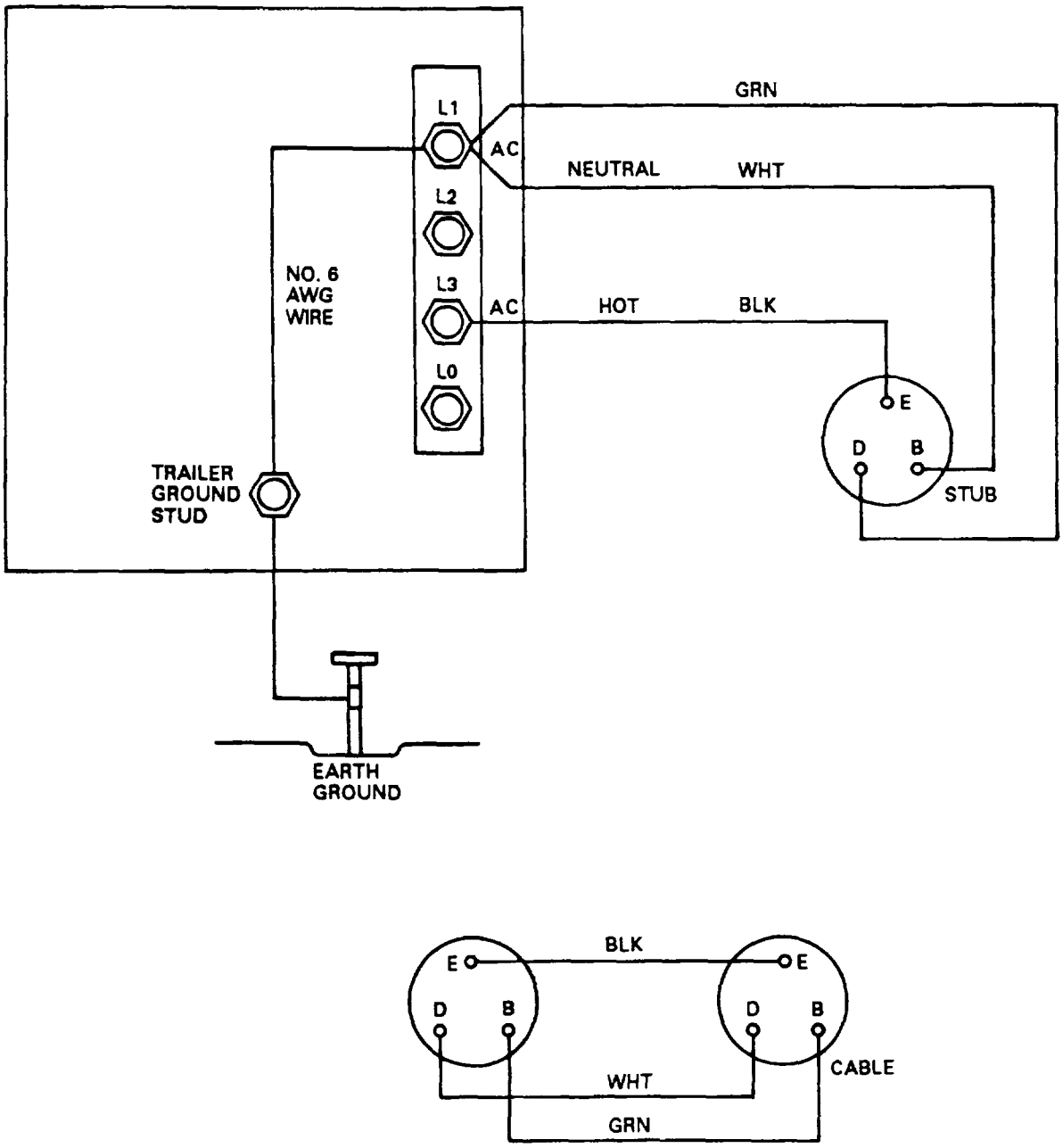


Figure 2-12. Generator Hookup: Two generator units, 120 volts, 60 Hz, single-phase ac (CX-4694C/U Power Cable with CX-4693C/U Stub) (Sheet I of 2).



NOTE: THIS DIAGRAM REPRESENTS CONNECTION OF CX-4693C/U STUB TO POWER PLANT AN/MJQ-18, COMPRISED OF TWO GENERATOR SETS.

4926-019

Figure 2-12. Generator Hookup: Two generator units, 120 volts, 60 Hz, single-phase ac (CX-4694C/U Power Cable with CX-4693C/U Stub) (Sheet 2 of 2).

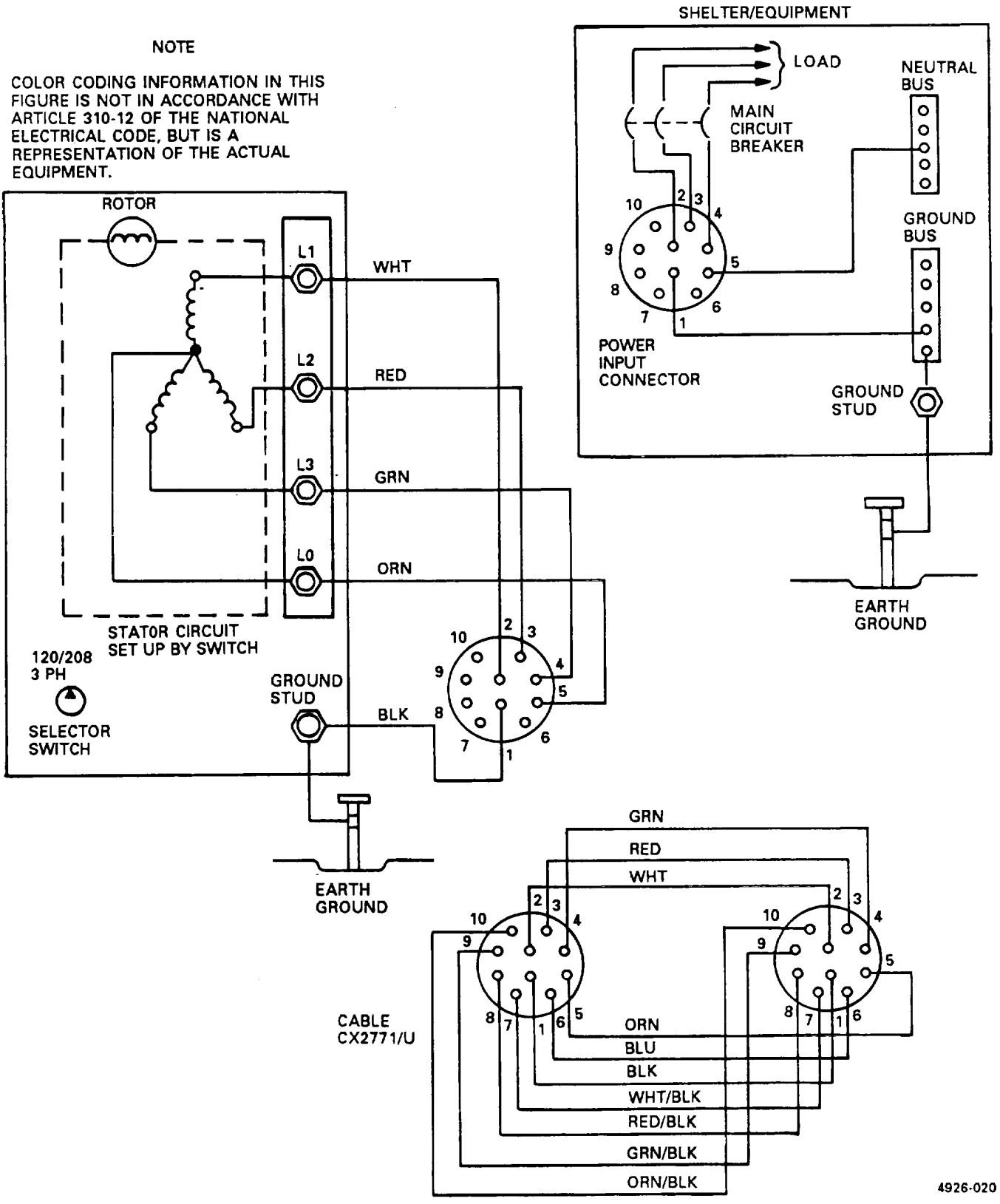


Figure 2-13. Generator Hookup: Single generator units 120/208 volts, 400 Hz, three-phase ac (CX-2771/U Power Cable, stub is part of generator set).

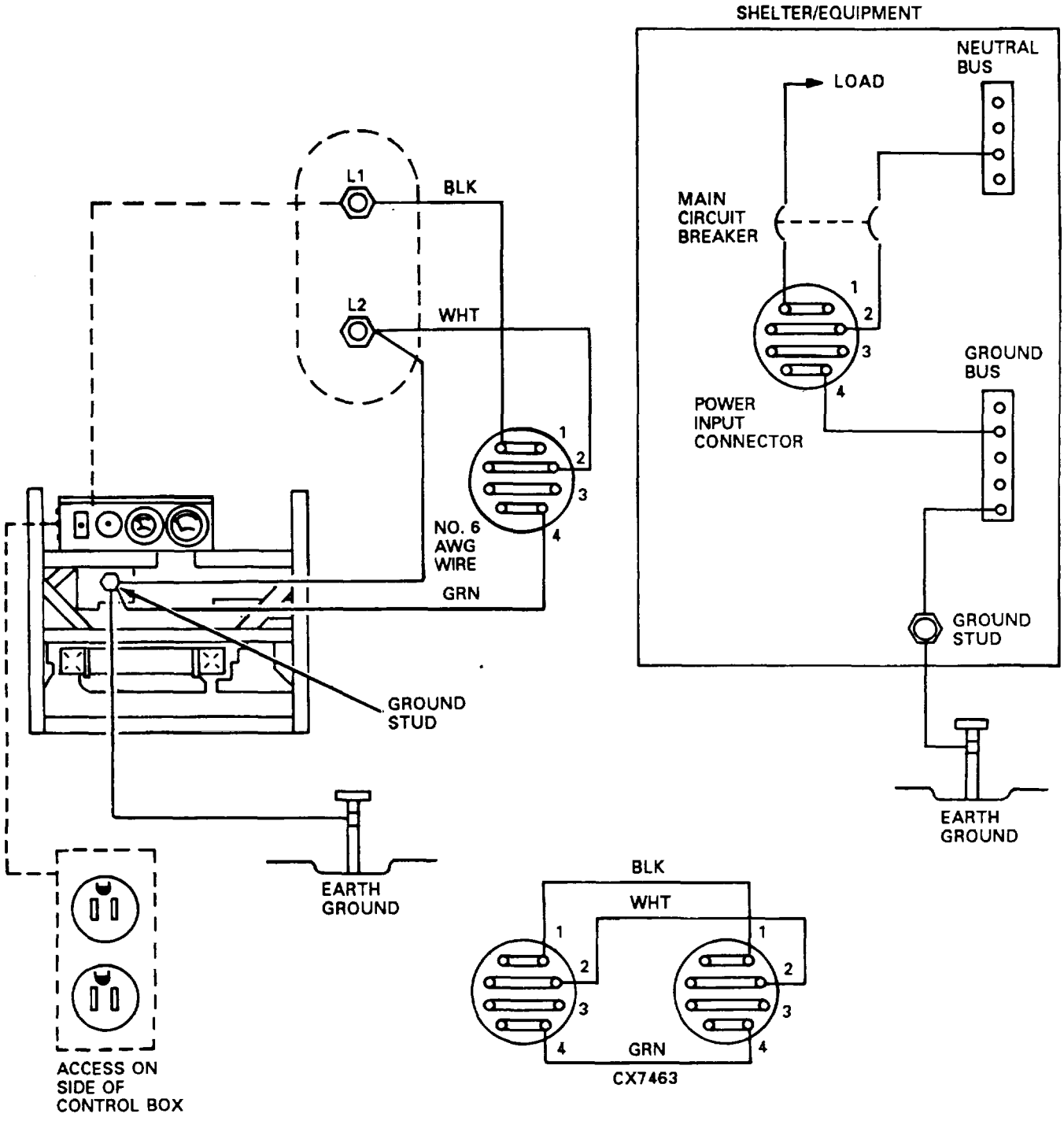


Figure 2-14. Generator Hookup: 1.5 KW single generator unit, 120 volts, 60 Hz, single-phase ac (CX-7453/U Power Cable with CX-7705/U Stub).

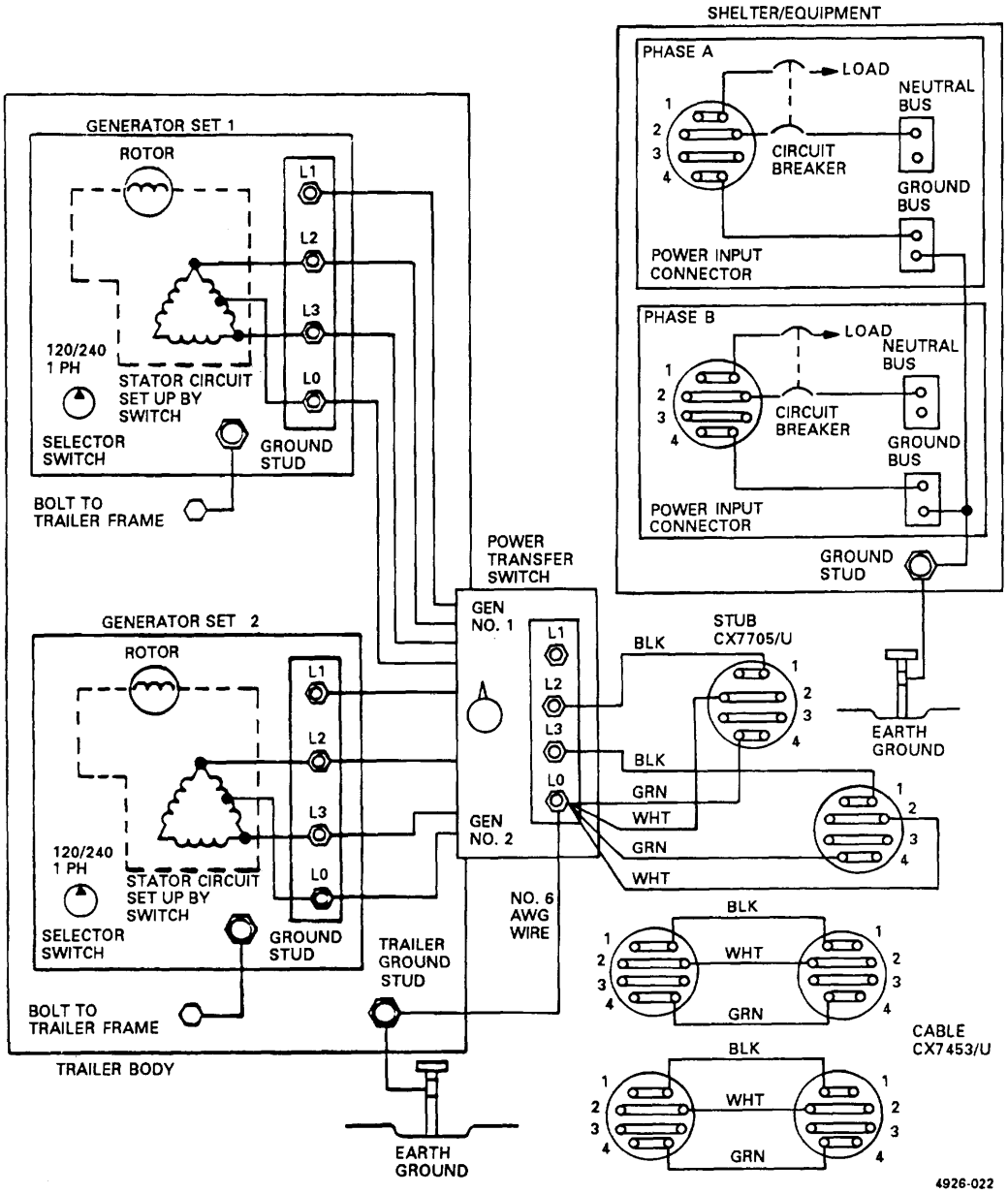


Figure 2-15. Generator Hookup: Two generator units, 120/240 volts, 60 Hz, split 120 volts single-phase ac (CX-7453/U Power Cable with CX-7705/U Stub).

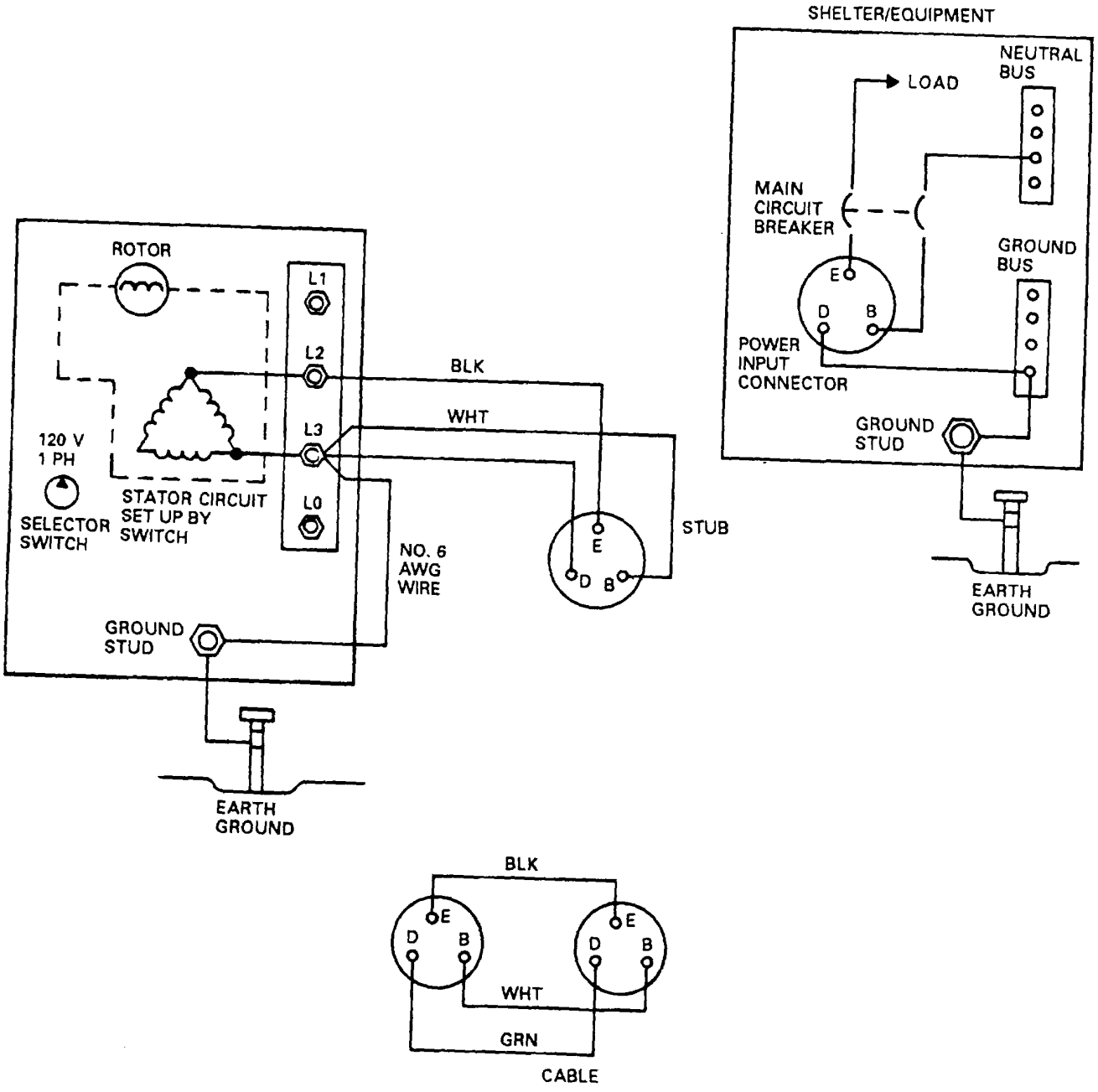
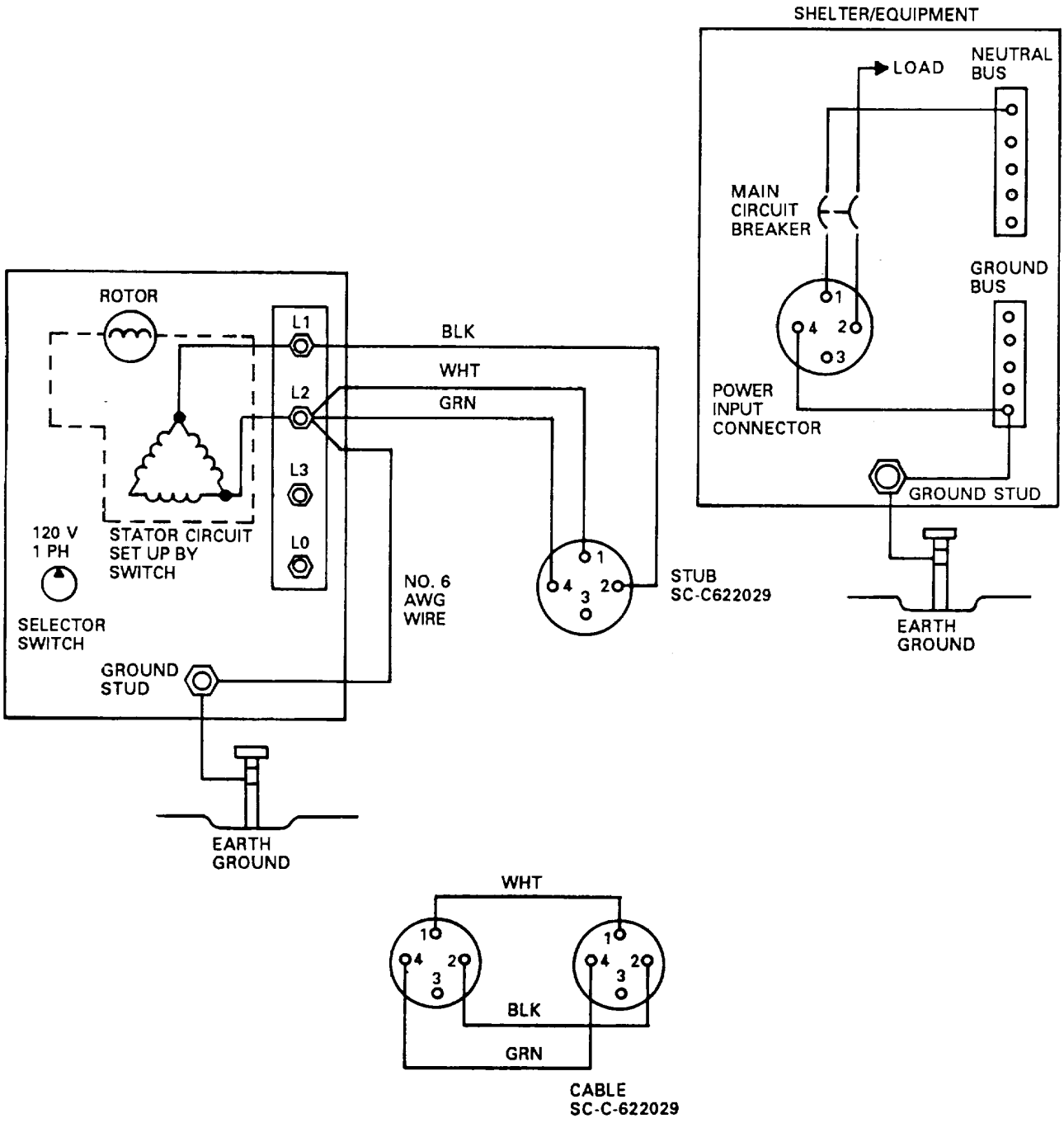
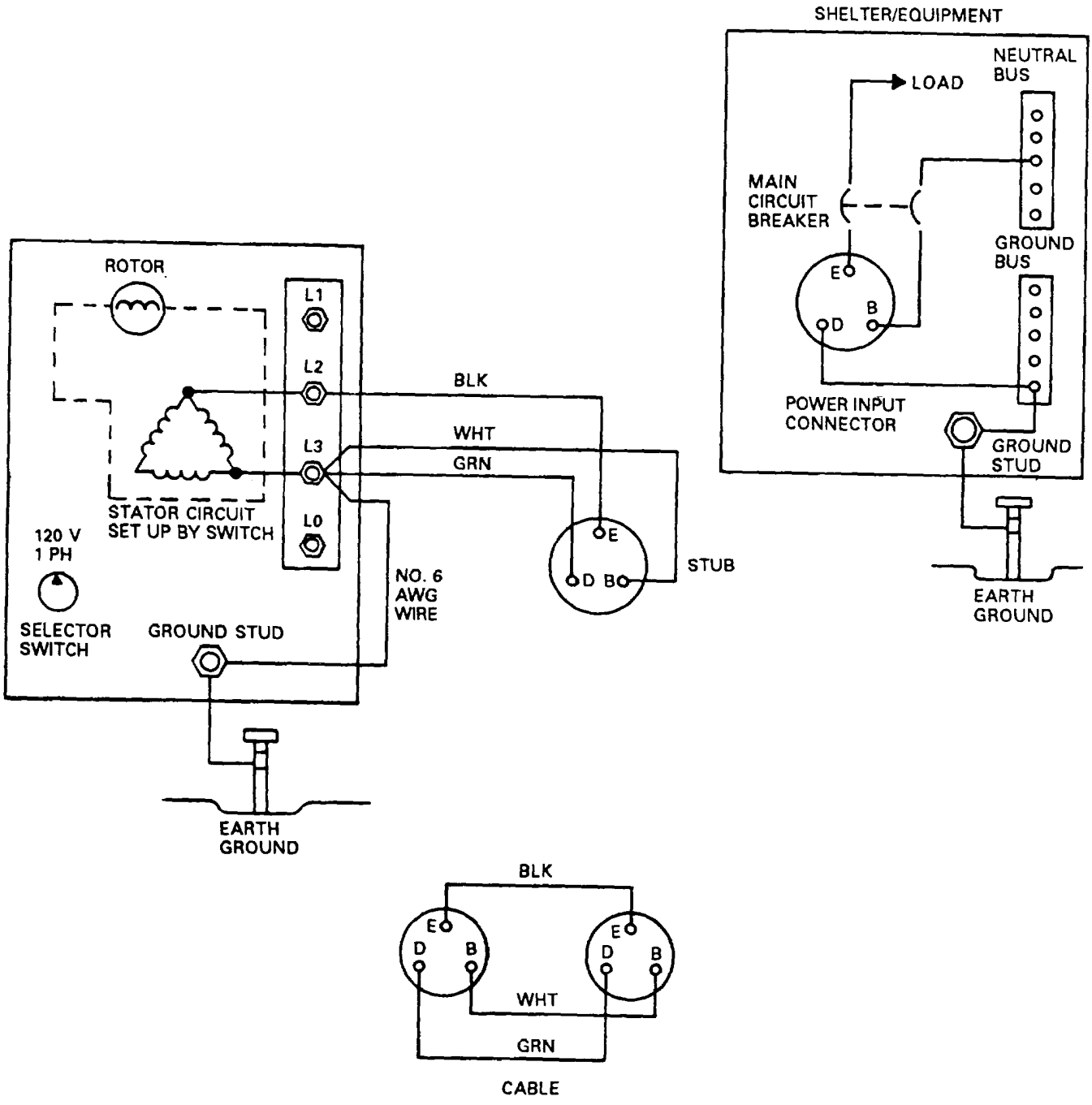


Figure 2-16. Generator Hookup: Single generator unit, 120 volts, 60 Hz, single-phase ac (CX-4694C/U Power Cable with CX-4693C/U Stub).



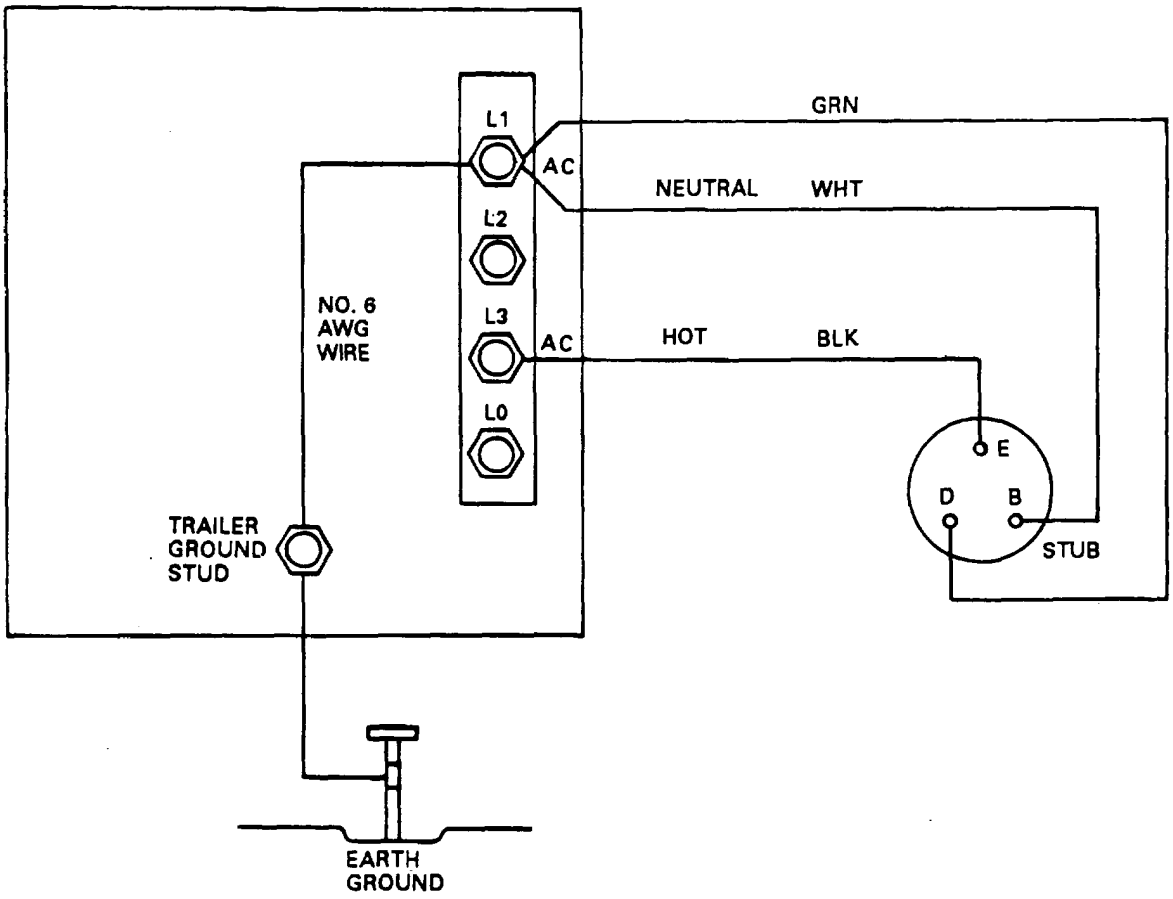
4926-024

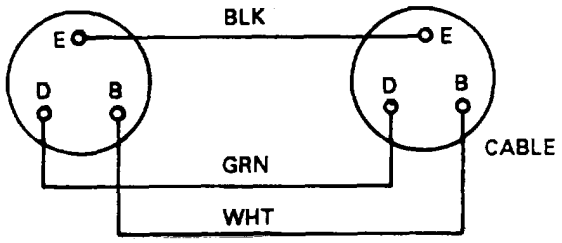
Figure 2-17. Generator Hookup: Single generator unit, 120 volts, 60 Hz, single-phase ac (SC-C-622029 Power Cable with SC-C-622028 Stub).



4926-025

Figure 2-18. Generator Hookup: Single generator unit, 5 KW, 120 volts, 60 Hz, single-phase ac (CX-4694C/U Power Cable with CX-4693C/U Stub (Sheet 1 of 2).





NOTE: THIS DIAGRAM REPRESENTS CONNECTION OF CX-4693C/U POWER CABLE STUB TO POWER PLANT AN/MJQ-16, COMPRISED OF TWO GENERATOR SETS.

Figure 2-18. Generator Hookup: Single generator unit, 5 KW, 120 volts, 60 Hz, single-phase ac (CX-4694C/U Power Cable with CX-4693C/U Stub (Sheet 2 of 2).

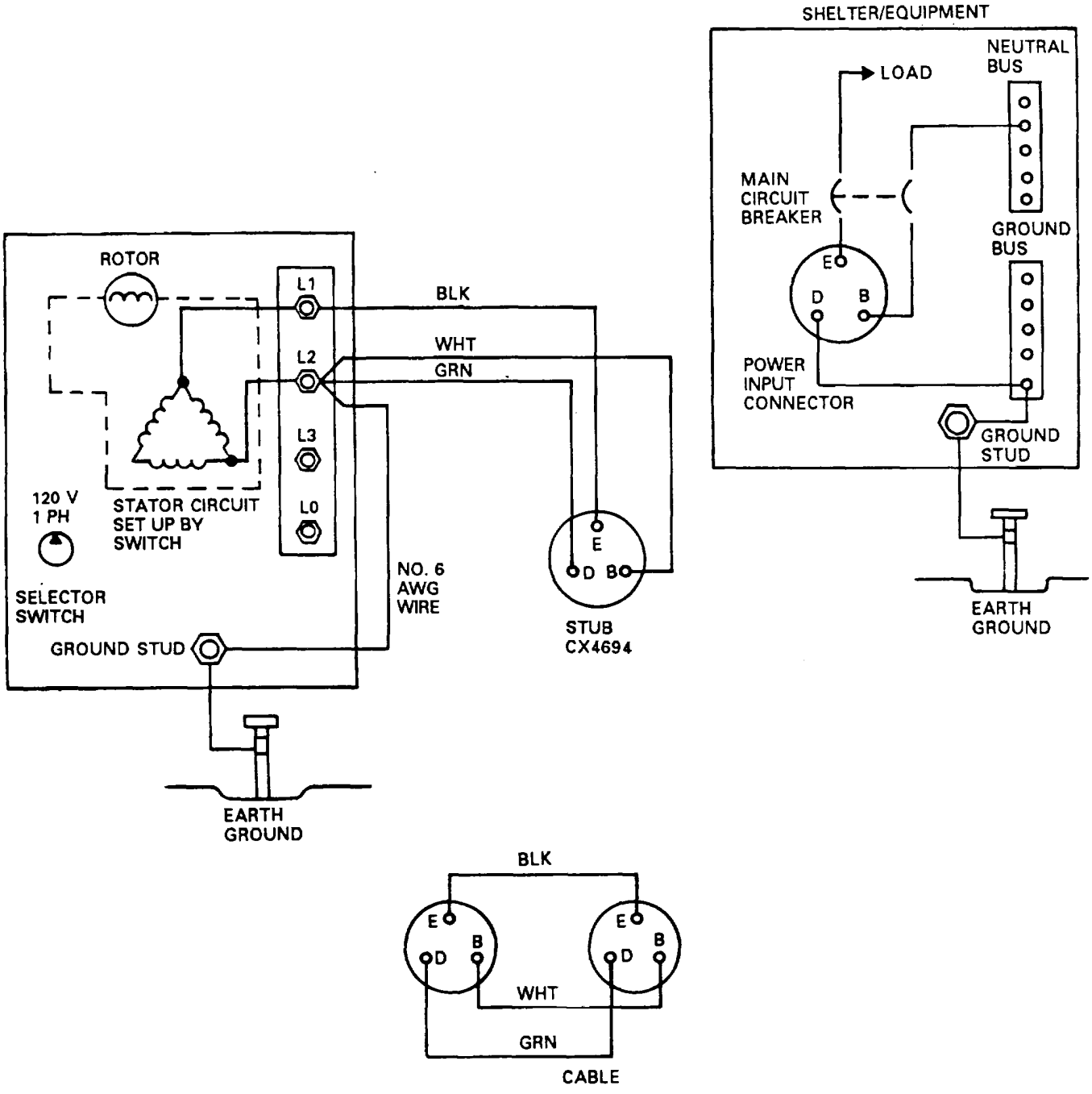


Figure 2-19. Generator Hookup: Single generator unit, 10 KW, 120 volts, 60 Hz, single-phase ac (CX-4694C/U Power Cable with CX-4693C/U Stub).

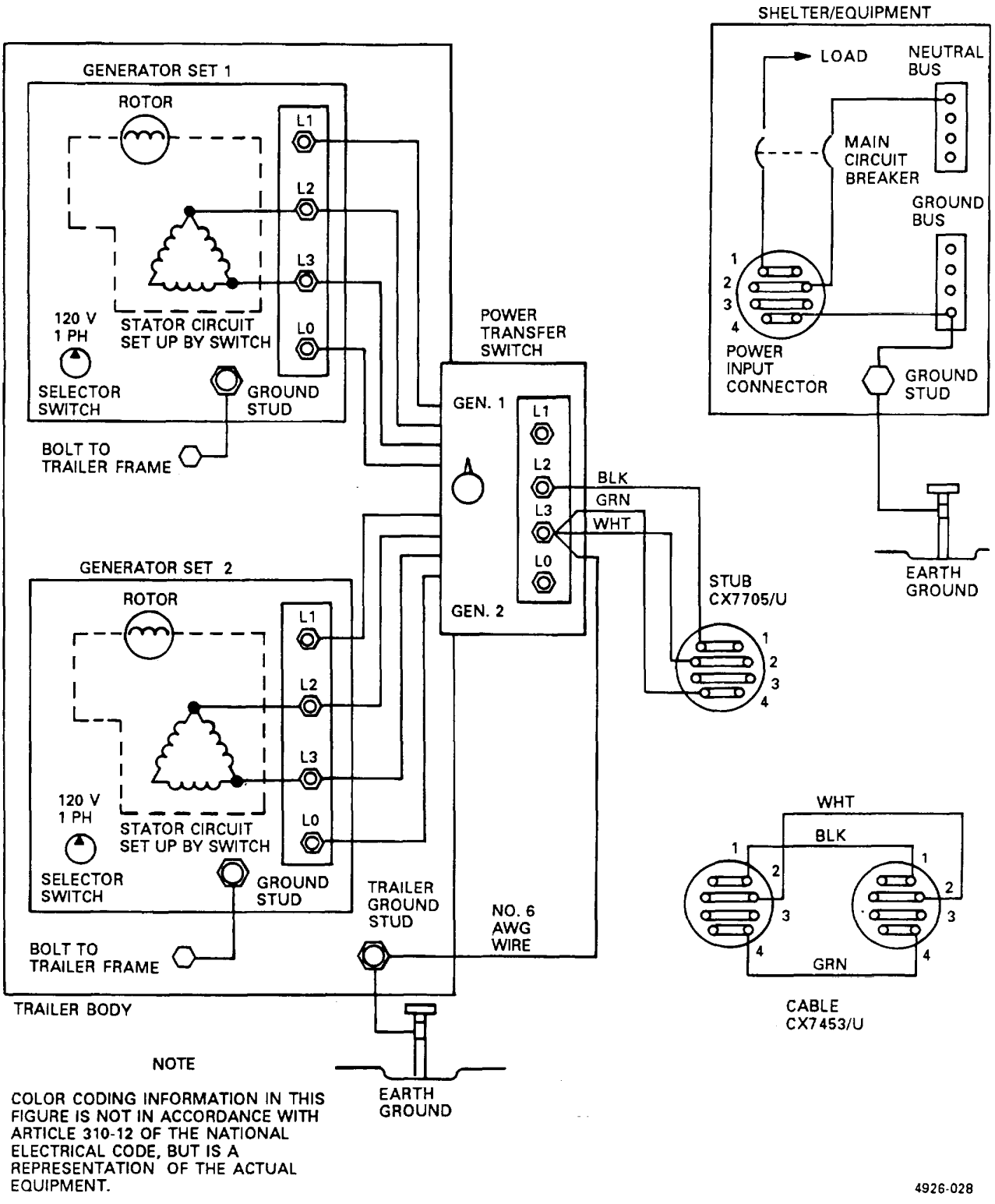


Figure 2-20. Generator Hookup: Two generator unit, 120 volts, 60 Hz, single-phase ac (CX-7453/U Power Cable and CX-7705/U Stub), and generator transfer switch assembly.

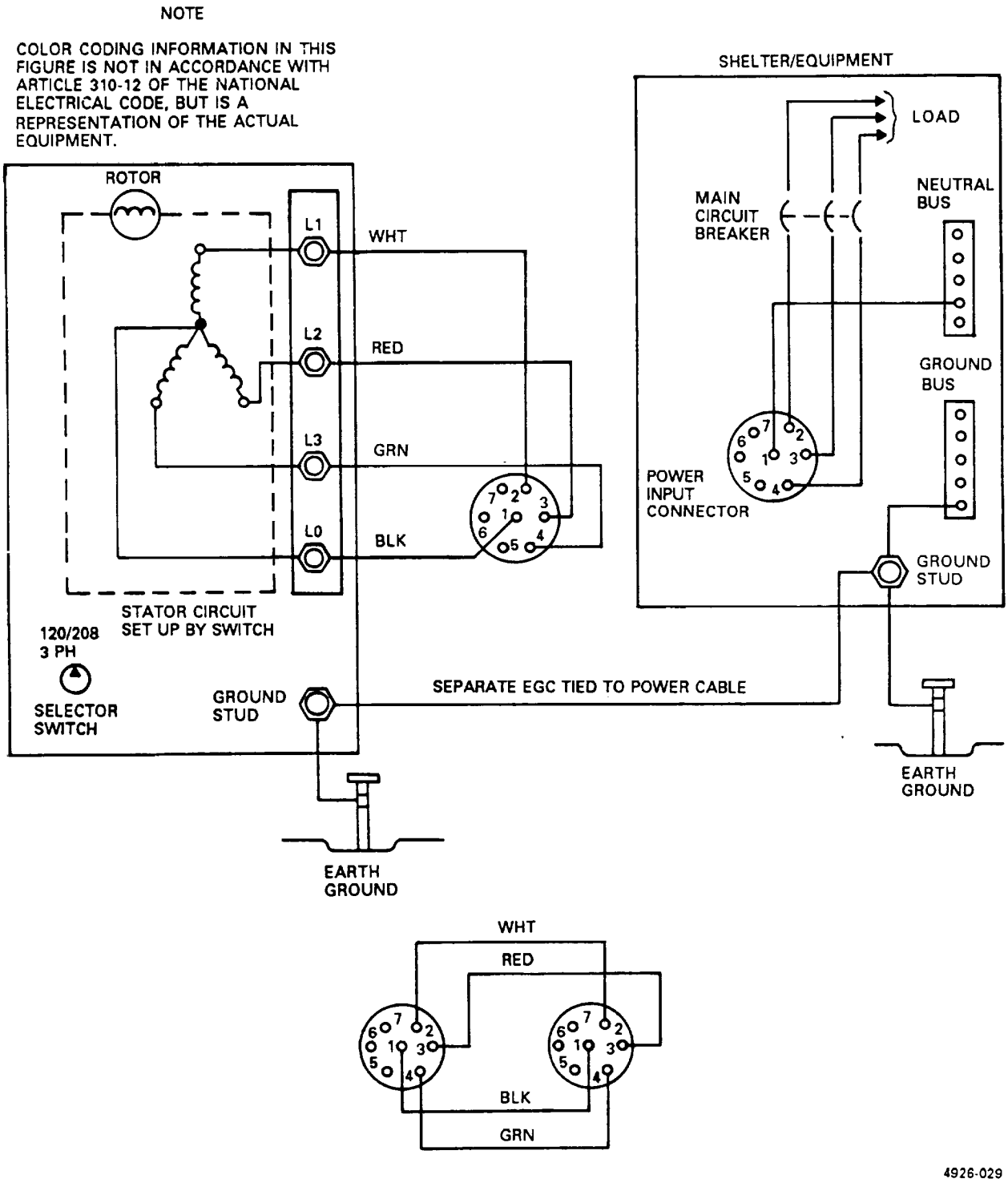


Figure 2-21. Generator Hookup: Single generator unit, 120/208 volts, 400 Hz, three-phase WYE (Y) ac (CX- 11081/U Power Cable).

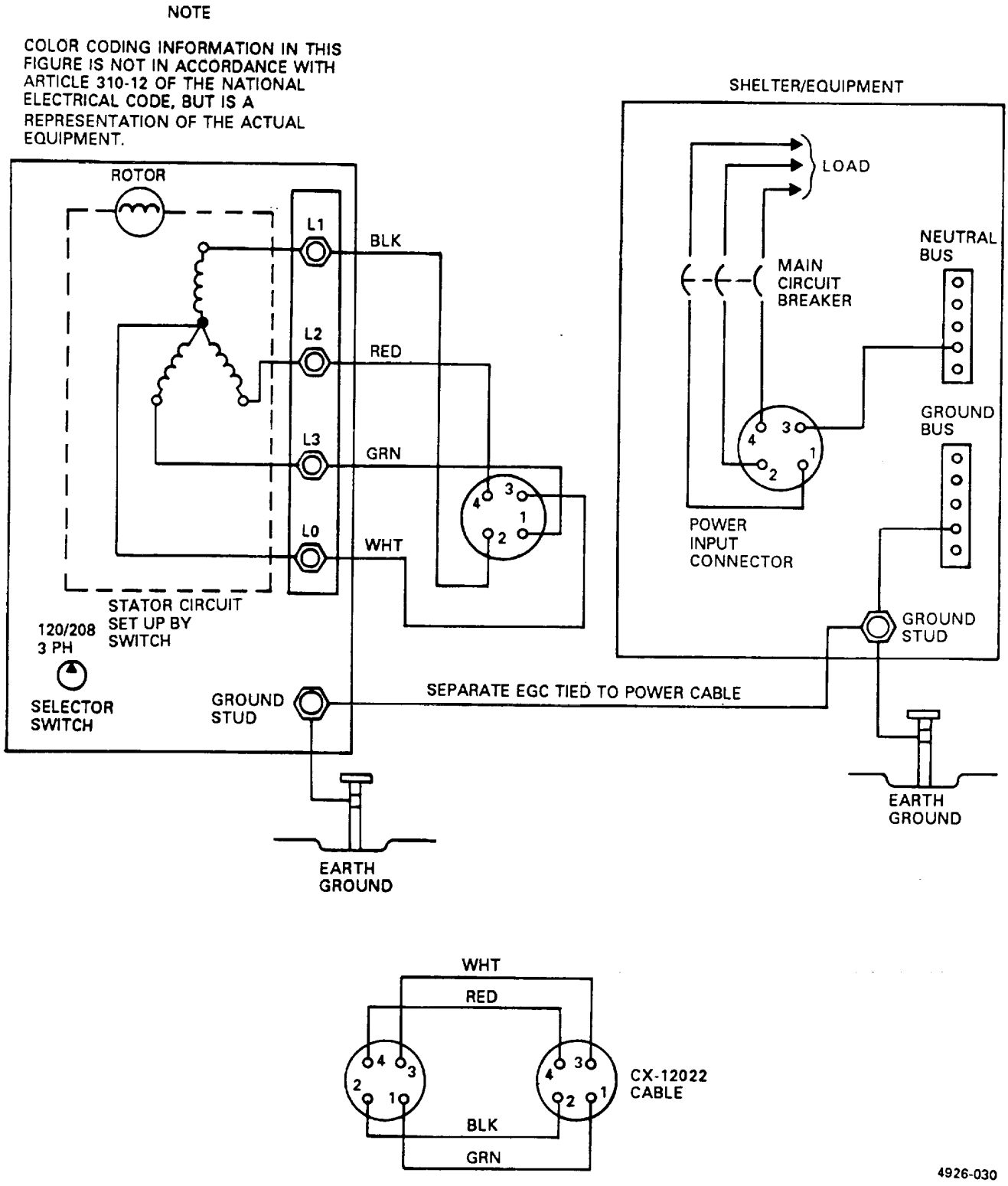


Figure 2-22. Generator Hookup: Single generator unit, 120/208 volts, 400 Hz, three-phase WYE (Y) split into three single-phase 120 volt ac circuits, (CX- 12022/U Power Cable).

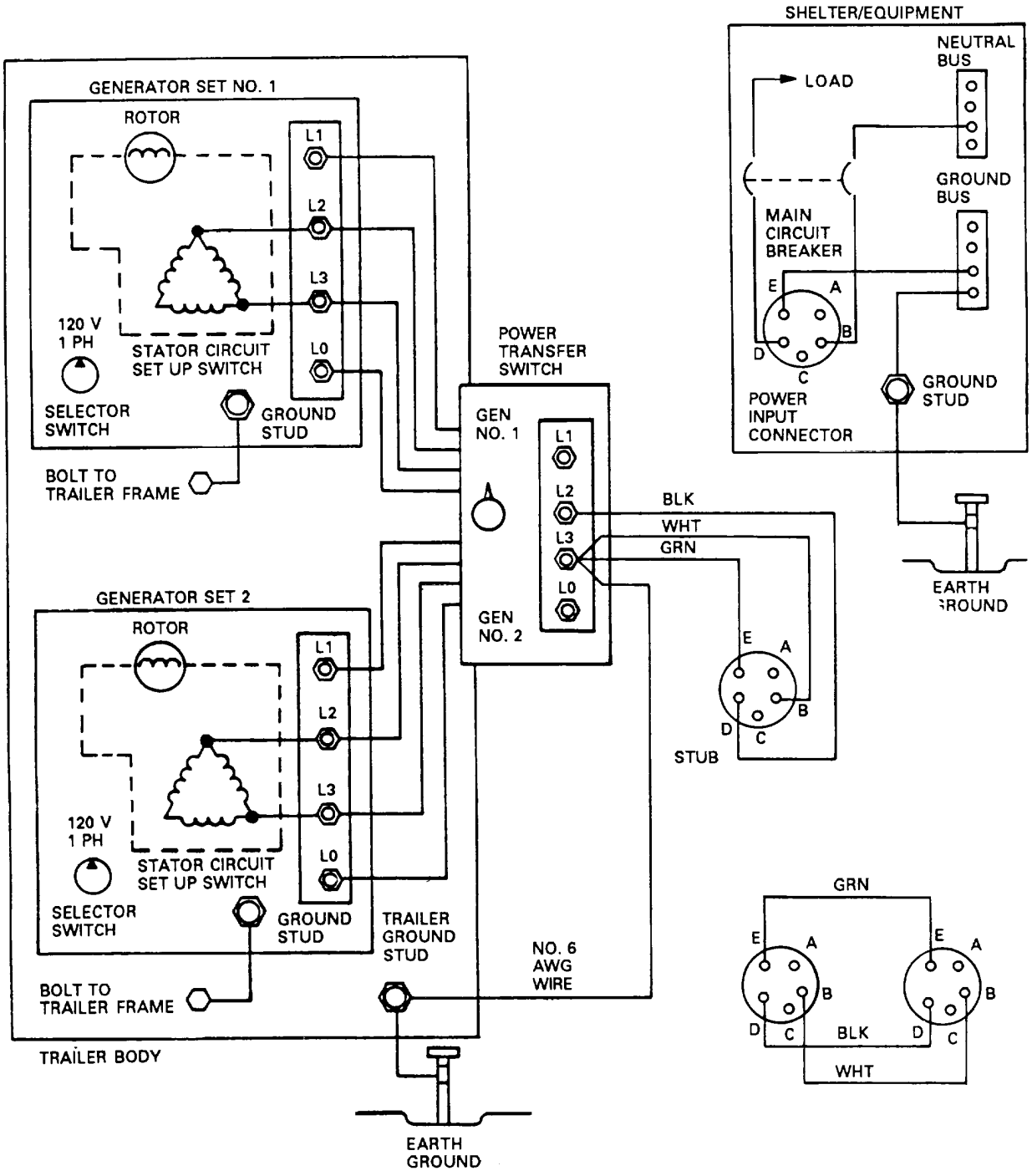
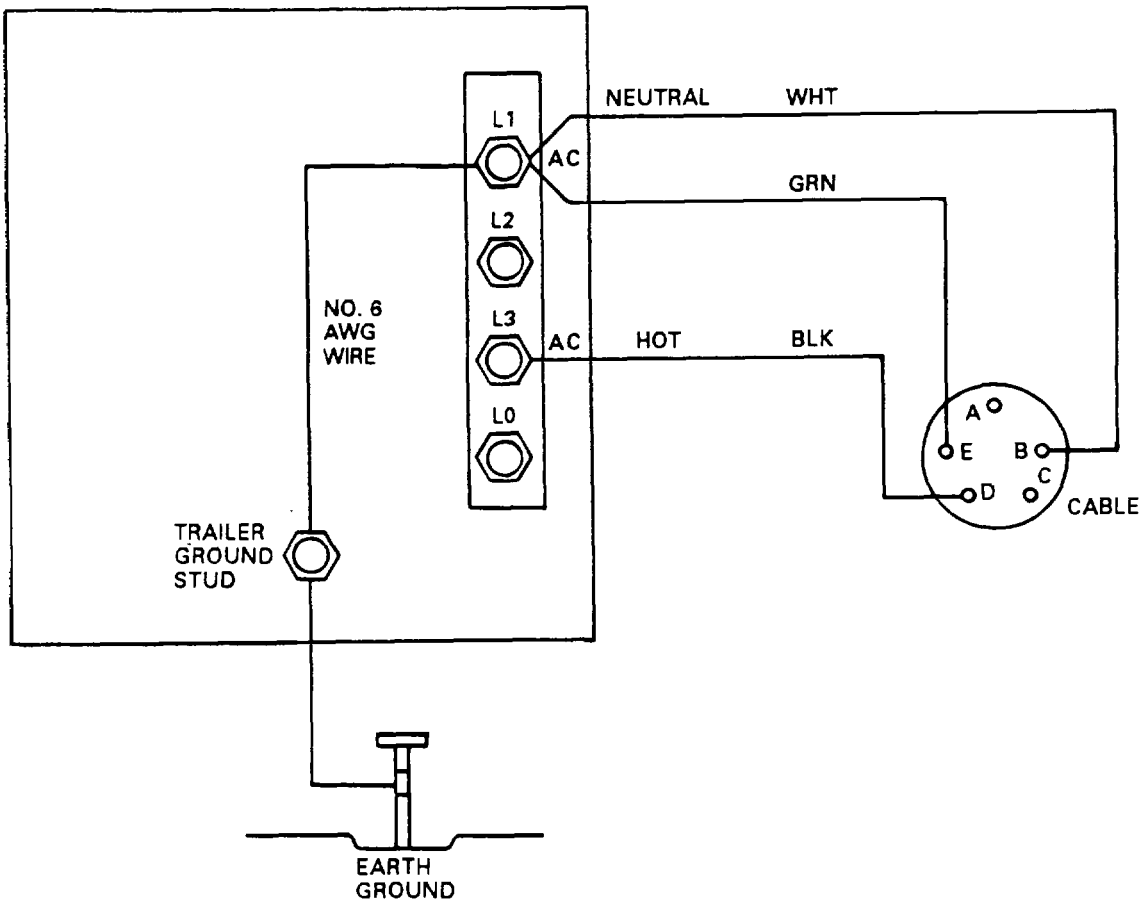


Figure 2-23. Generator Hookup: Two generator units, 120 volts, 60 Hz, single-phase ac (CX-2440/U Power Cable) (Sheet I of 2).



NOTE: THIS DIAGRAM REPRESENTS CONNECTION OF CX-2440/U POWER CABLE TO POWER PLANT AN/MJQ-18, COMPRISED OF TWO GENERATOR SETS.

Figure 2-23. Generator Hookup: Two generator units, 120 volts, 60 Hz, single-phase ac (CX-2440/U Power Cable) (Sheet 2 of 2).

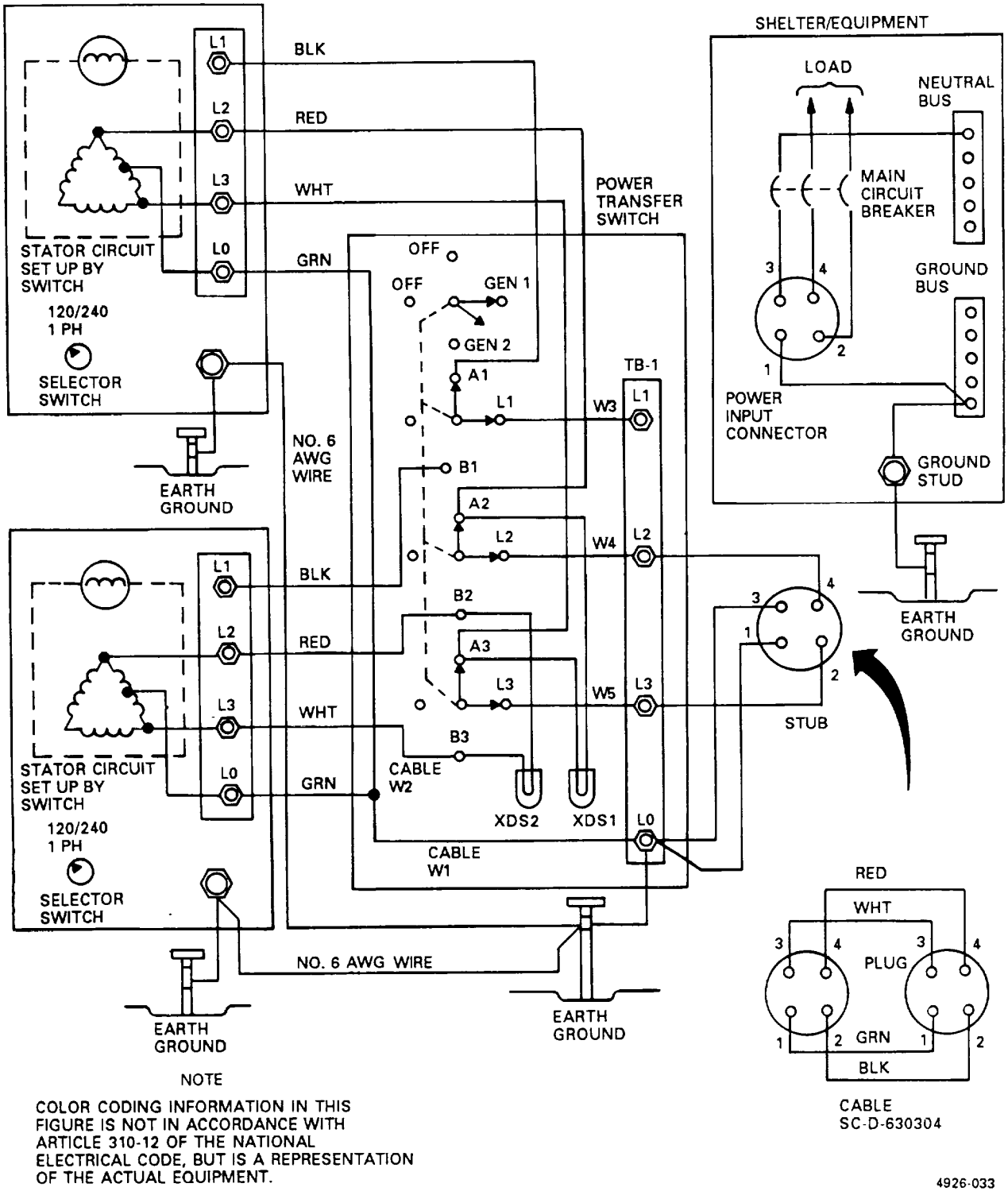
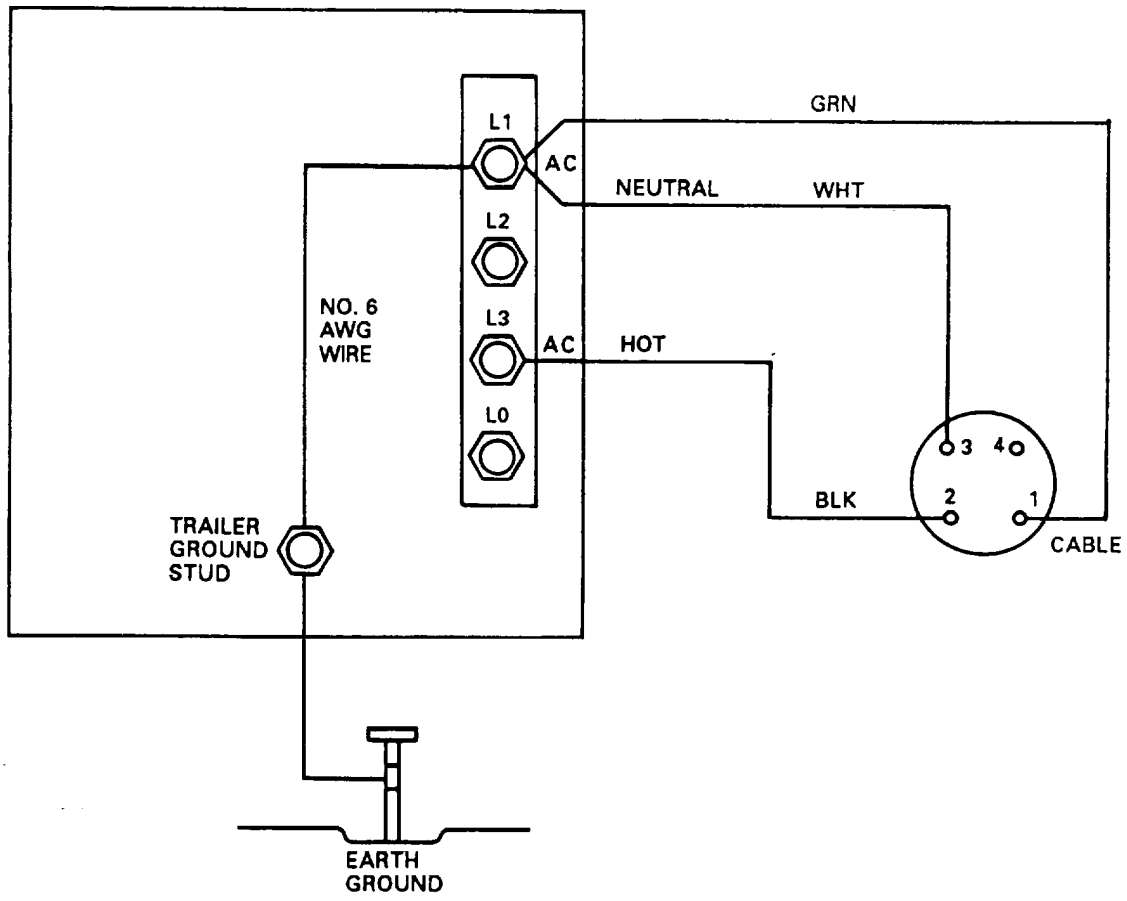


Figure 2-24. Generator Hookup: Two generator units, 120/240 volts, 60 Hz, split single-phase ac (SC-D-630304 Power Cable) (Sheet 1 of 2).



NOTE: THIS DIAGRAM REPRESENTS CONNECTION OF SC-D-630304 POWER CABLE TO POWER PLANT AN/MJQ-18, COMPRISED OF TWO GENERATOR SETS.

4926-034

Figure 2-24. Generator Hookup: Two generator units, 120/240 volts, 60 Hz, split single-phase ac (SC-D-630304 Power Cable) (Sheet 2 of 2).

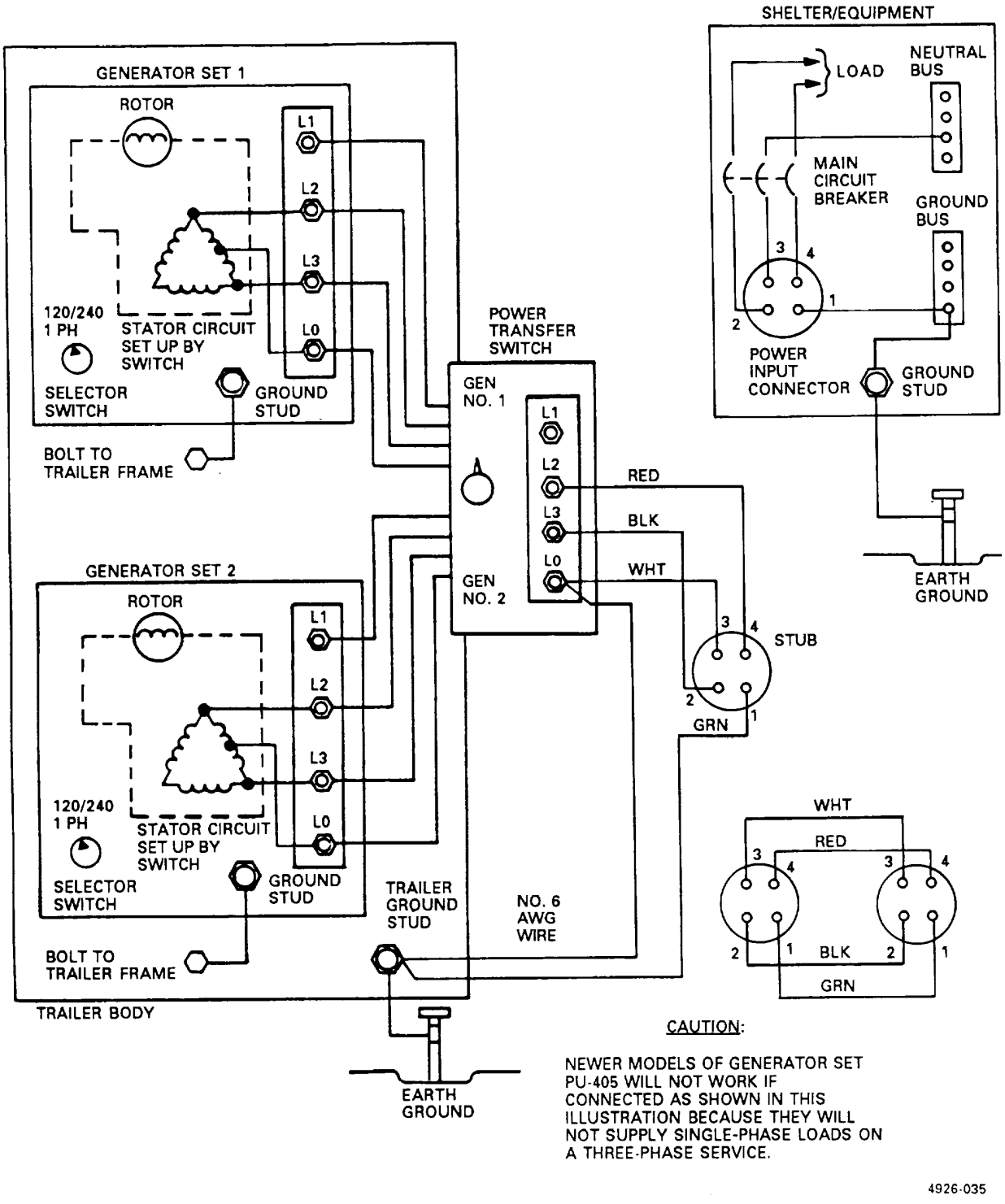


Figure 2-25. Generator Hookup: Two generator units 120/240 volts, 60 Hz, ac split into two 120 volt single-phase circuits (SC-D-602436 Power Cable).

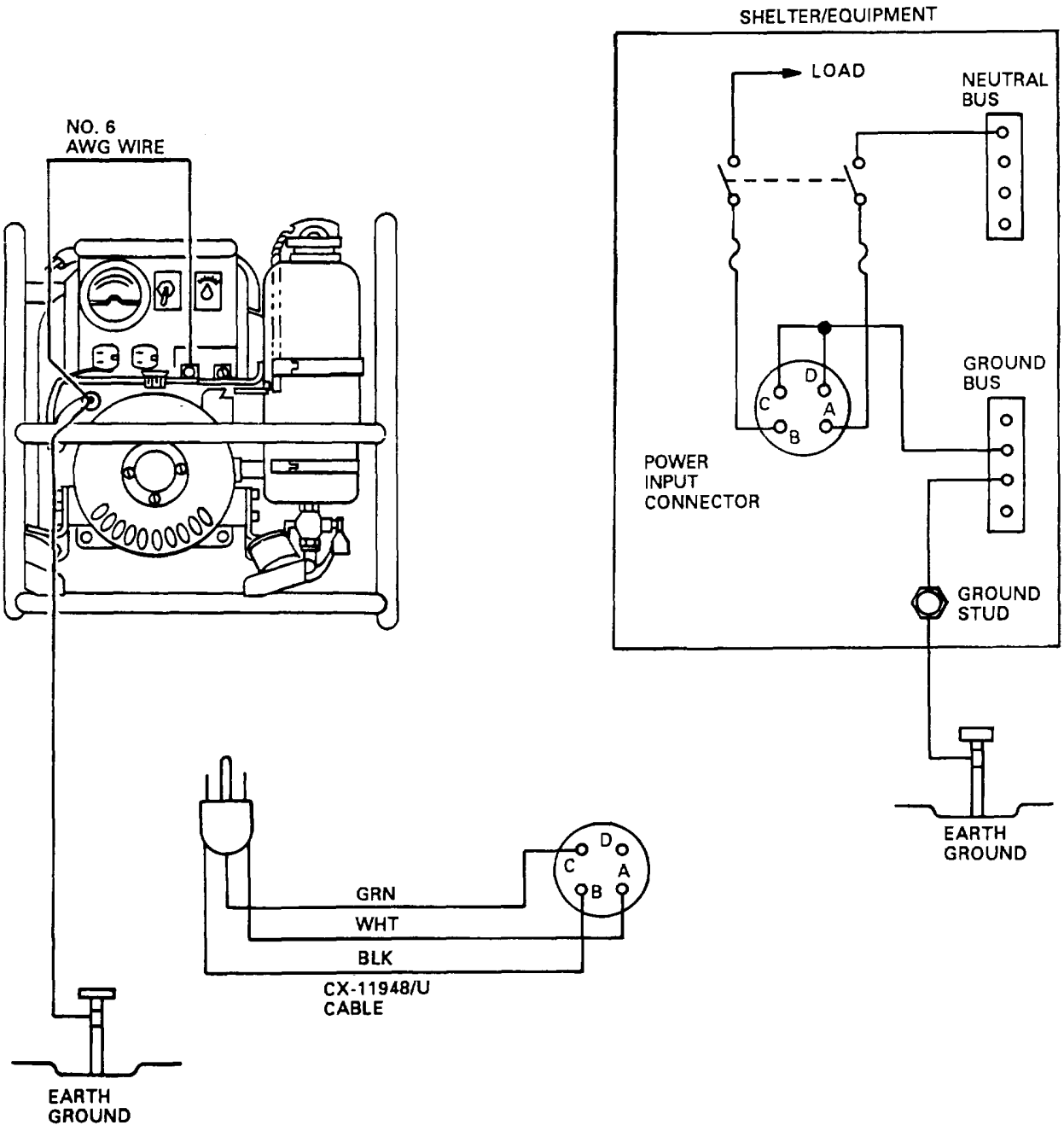


Figure 2-26. Generator Hookup: Lightweight generator, 120 volts, 60 Hz, single-phase ac (CX- 11948 Power Cable).

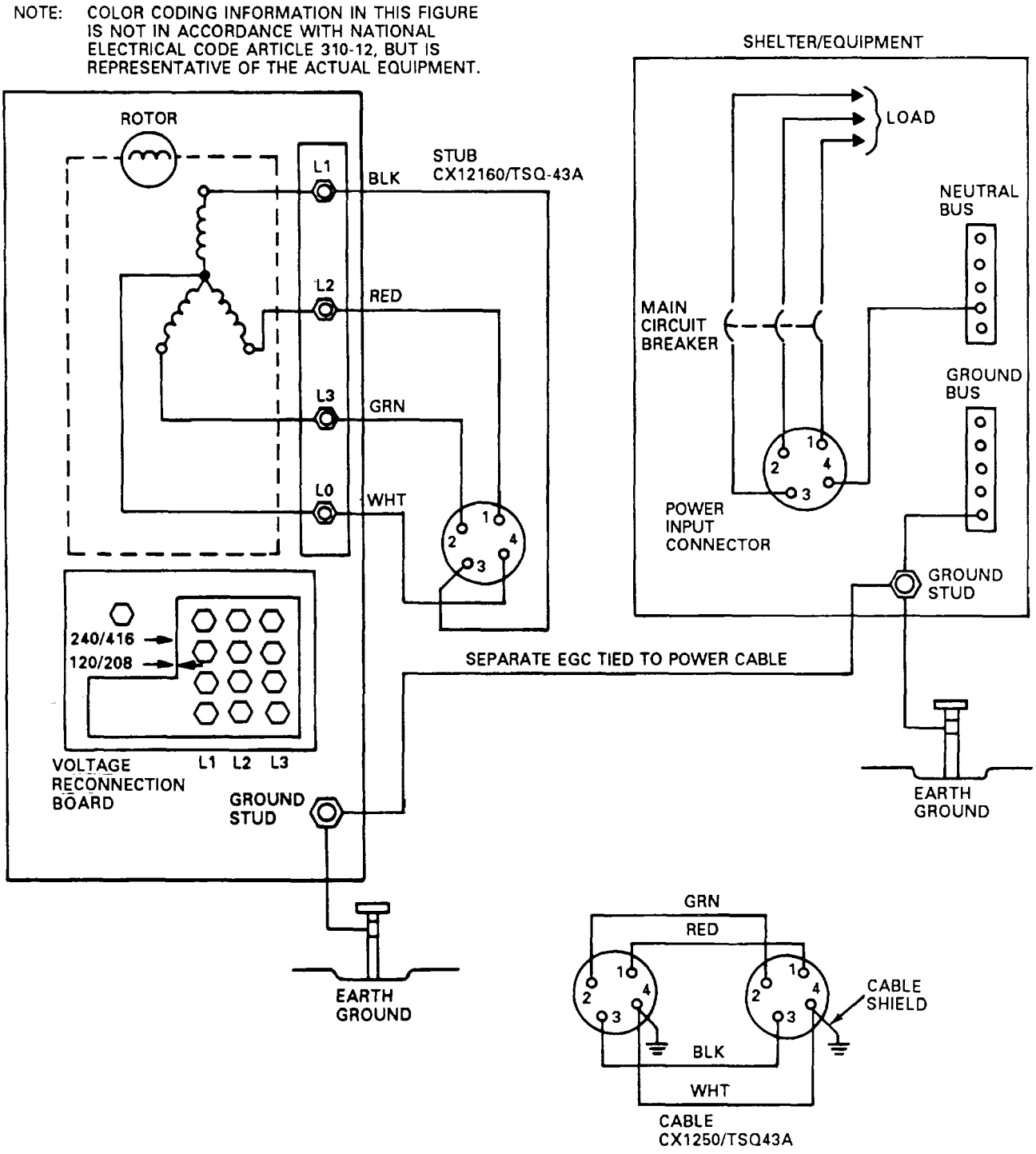
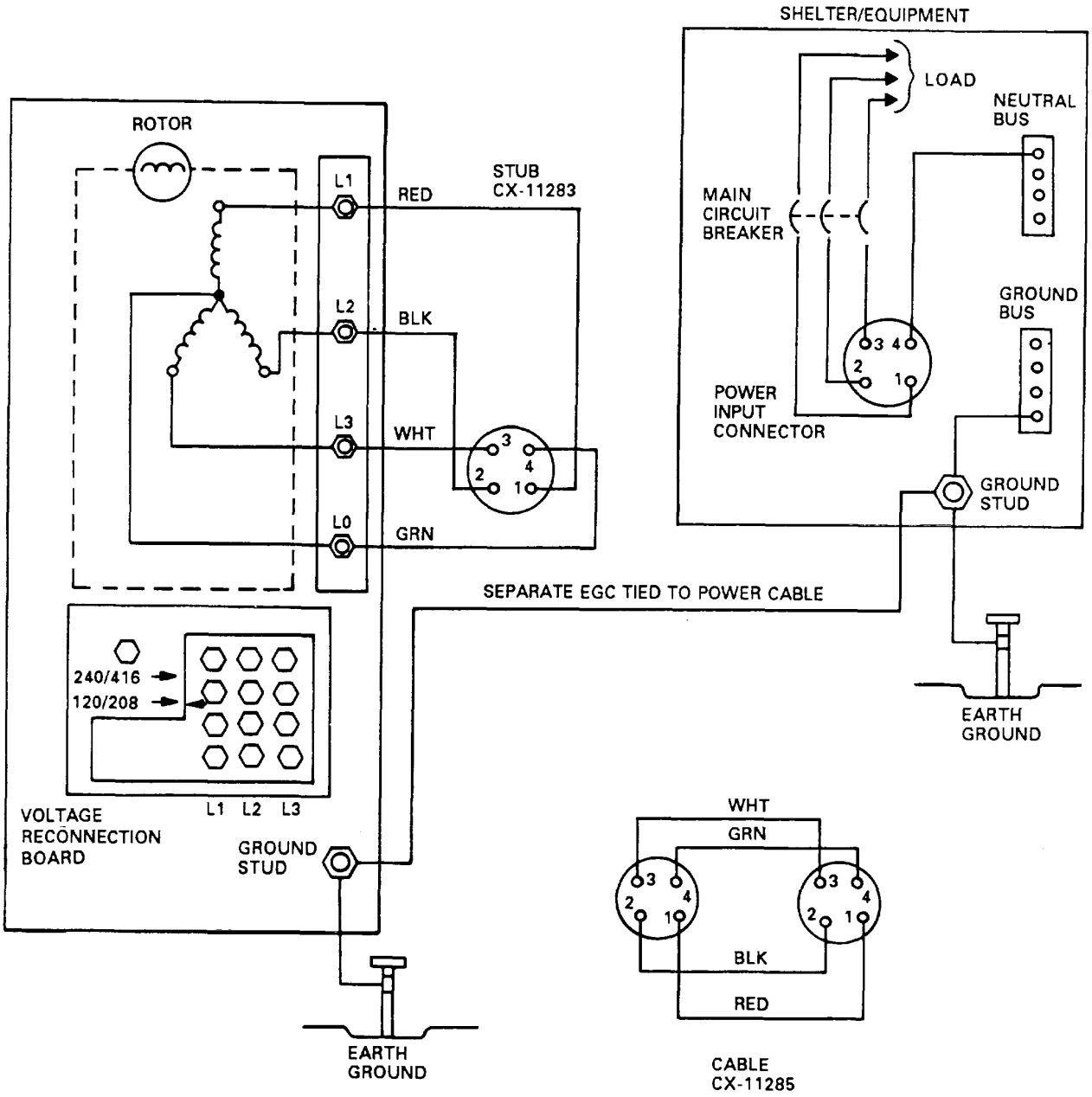


Figure 2-27. Generator Hookup: Single generator unit, 120/208 volts, 60 Hz, three-phase WYE (Y) split into three 120 volt-single-phase circuits (CX-12150/TSQ-43 Power Cable with CX- 12160TSQ-43 Stub).



NOTE

COLOR CODING INFORMATION IN THIS FIGURE IS NOT IN ACCORDANCE WITH ARTICLE 310-12 OF THE NATIONAL ELECTRICAL CODE, BUT IS A REPRESENTATION OF THE ACTUAL EQUIPMENT.

Figure 2-28. Generator Hookup: Single generator unit, 60 KW, 120/208 volts, 60 Hz, three-phase WYE (Y) ac (CX- 11285 Power Cable with CX- 11283 Stub).

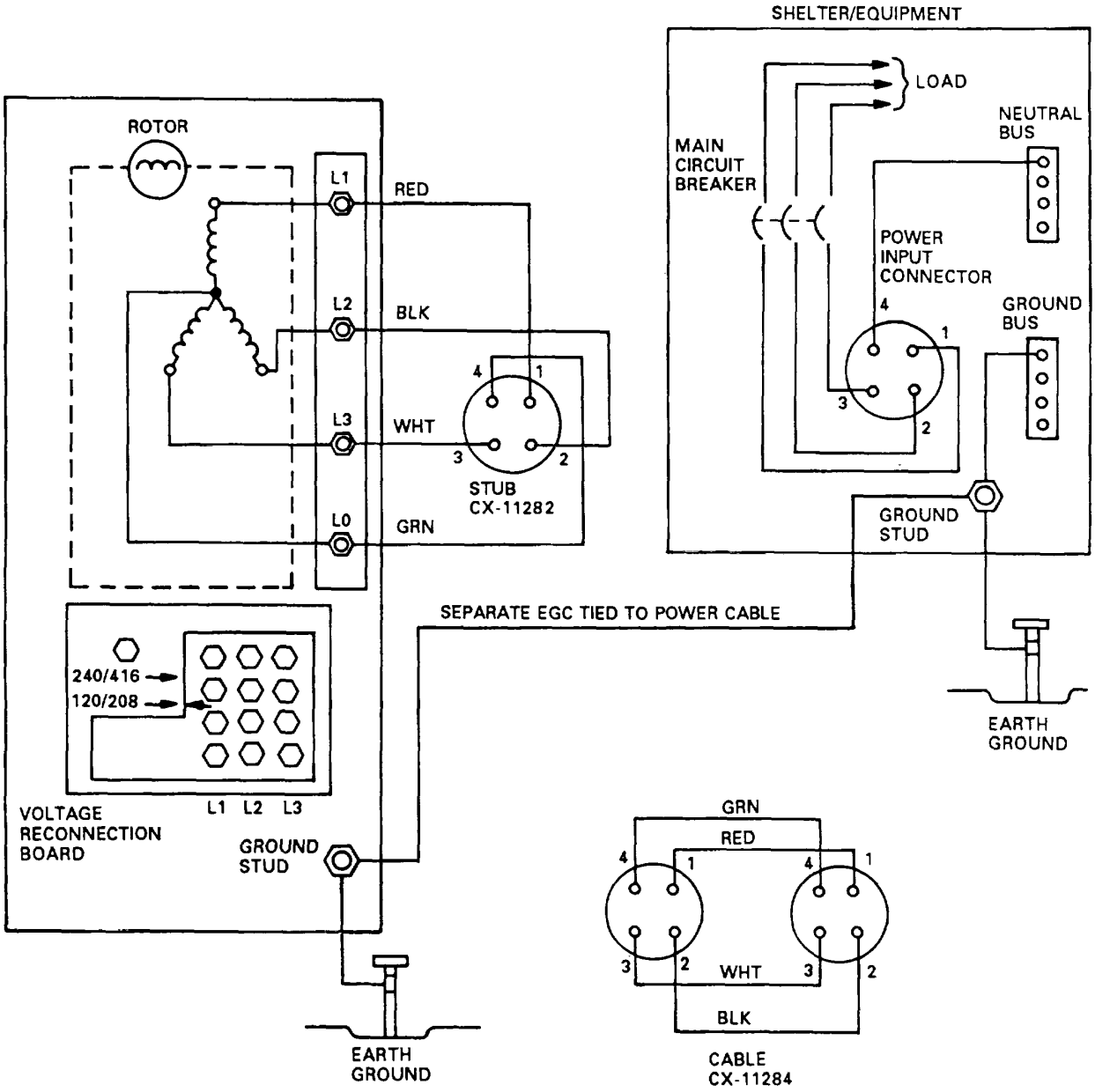


Figure 2-29. Generator Hookup: Single generator unit 30 KW, 120/208 volts, 60 Hz, three-phase WYE (Y) ac (CX- 11284 Power Cable with CX- 11283 Stub).

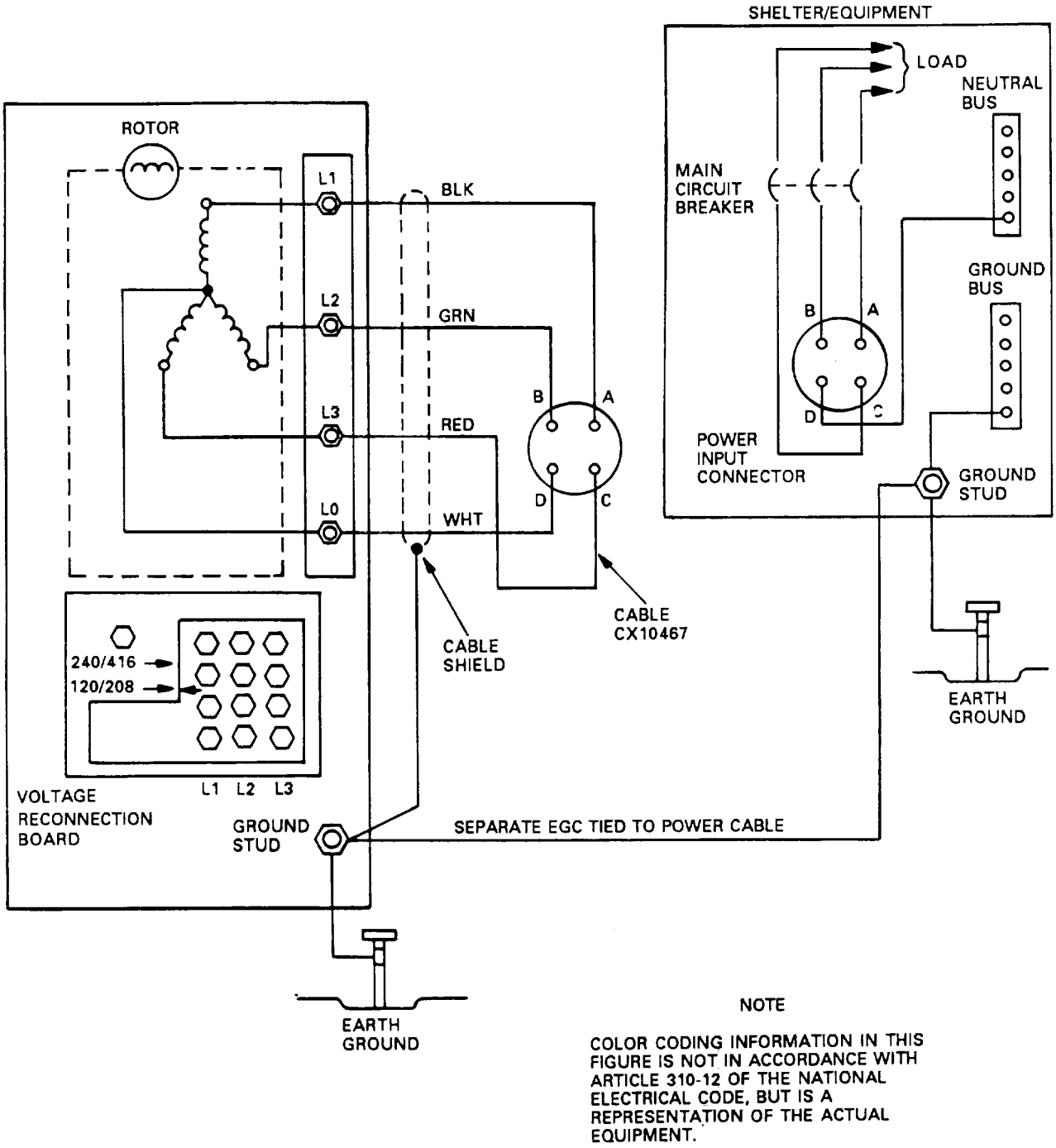


Figure 2-30. Generator Hookup: 60 KW single generator unit, 120/208 volts, 400 Hz, three-phase WYE (Y) ac (CX- 10467 Power Cable).

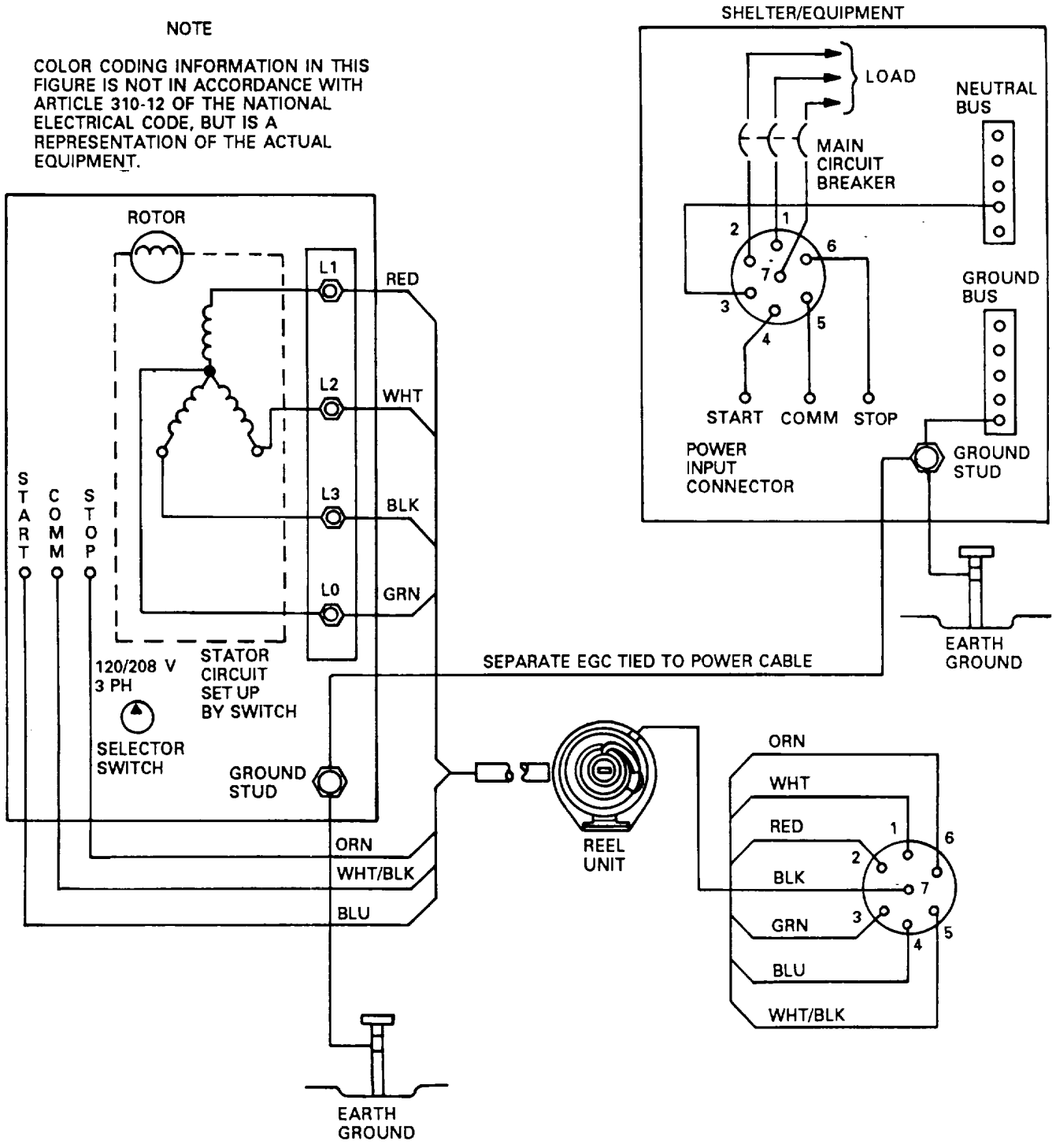


Figure 2-31. Generator Hookup: Single generator unit, 120/208 volts, 400 Hz, three-phase ac (Cable Reel Unit RL-260 with Cable LM 91103672).

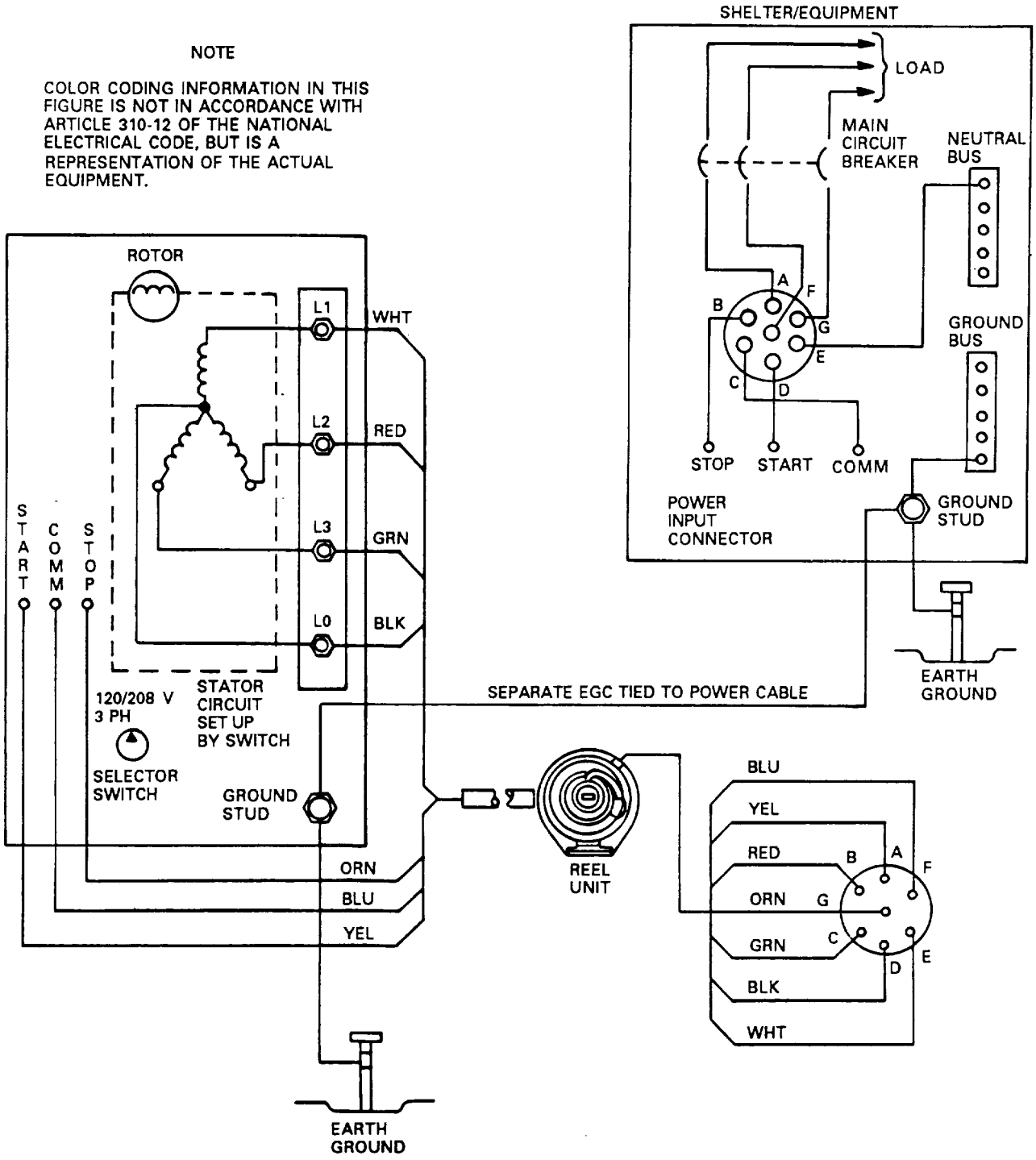


Figure 2-32. Generator Hookup: Single generator unit, 120/208 volts, 400 Hz, three-phase ac (Cable Reel Unit RL-260 with cable).

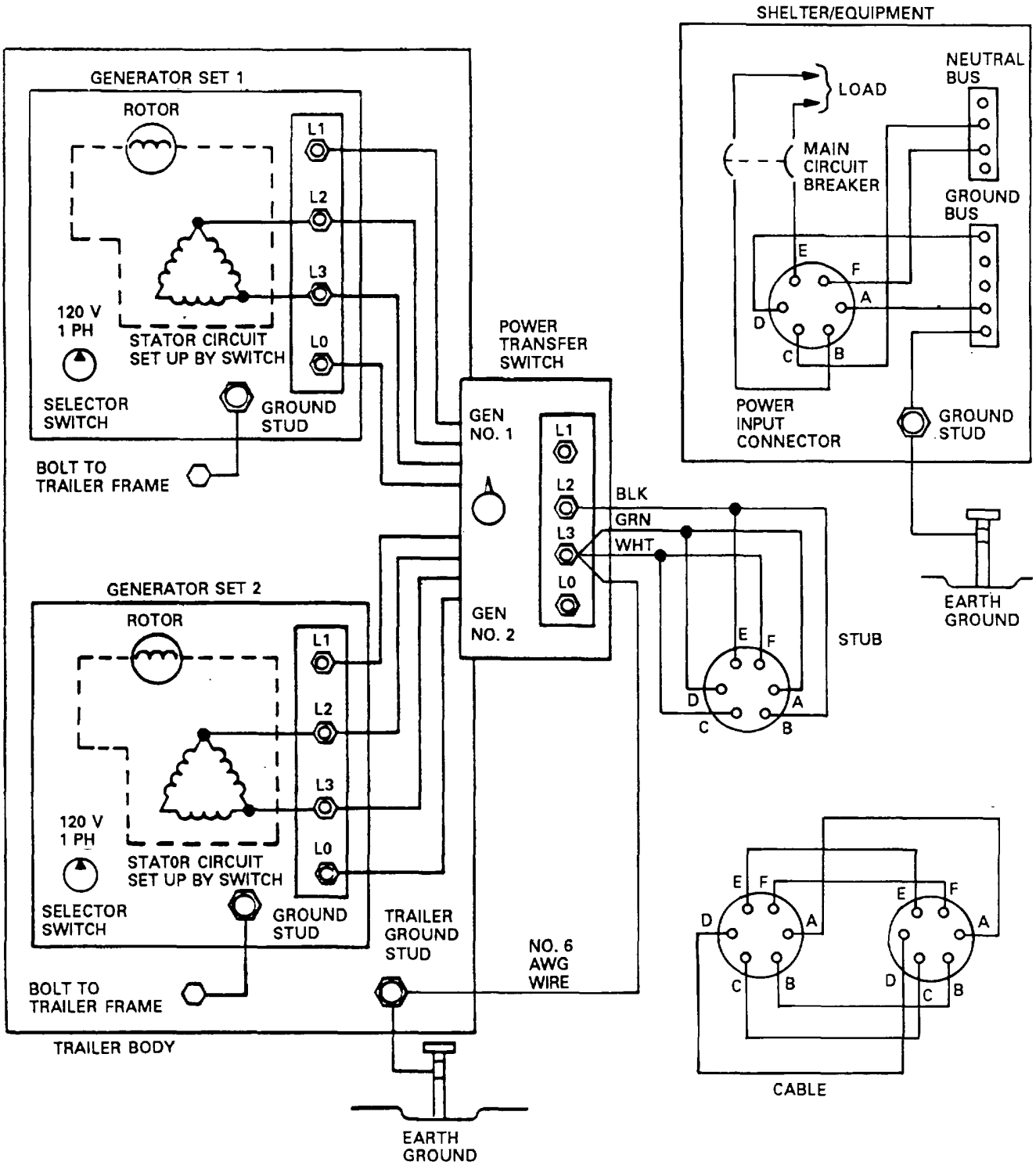


Figure 2-33. Generator Hookup: Two Generator Unit, 120 volts, 60 Hz, single-phase ac (Cable SM-D-777225- 1 and SM-D-777226- 1) (multiple ground bonding wires in cable).

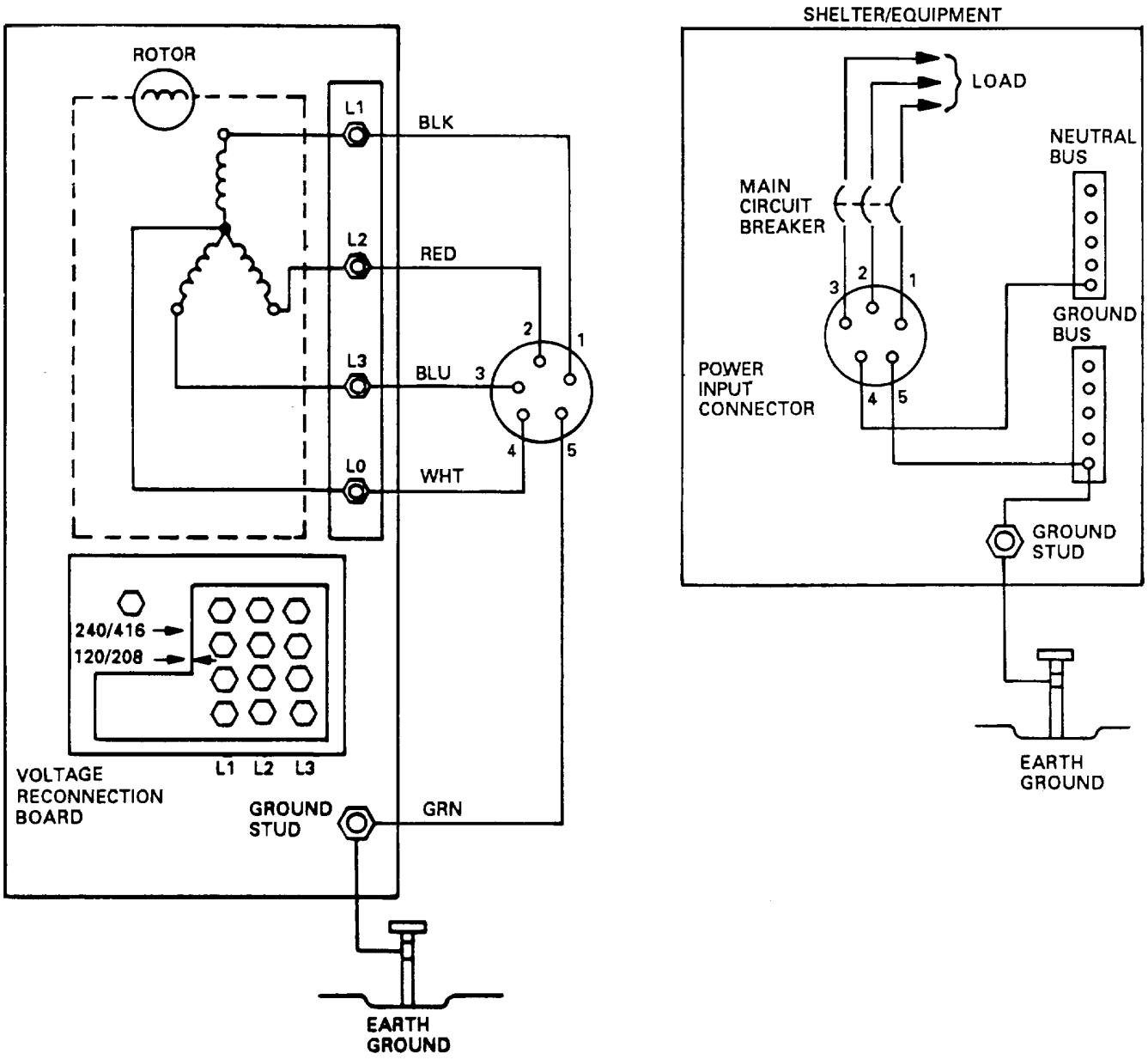


Figure 2-34. Generator Hookup: 120/208 volts, 60 Hz, three-phase WYE (Y) power with Cable Assembly 81-28933-001.

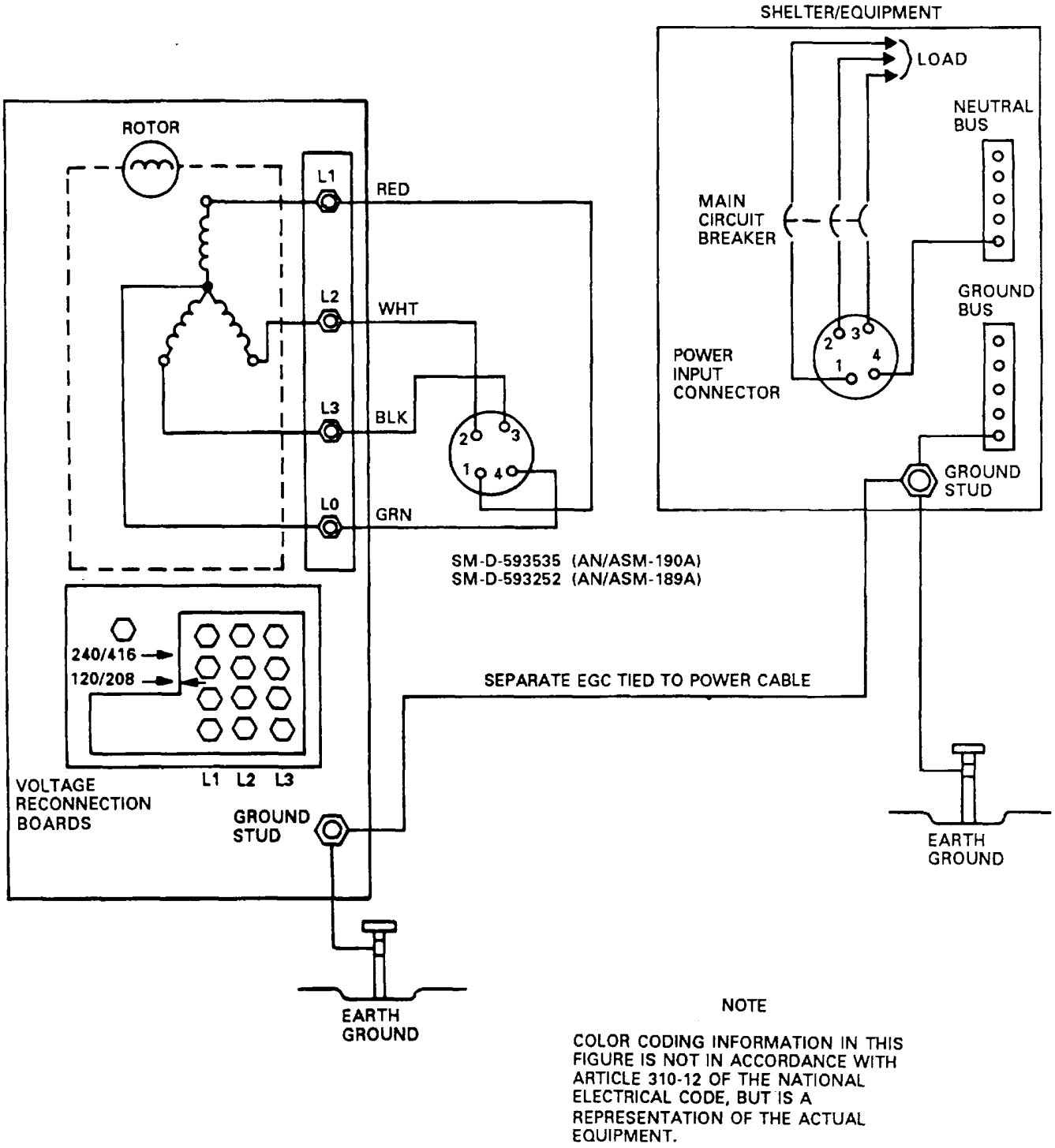


Figure 2-35. Generator Hookup: Single generator unit, 120/208 volts, ac 60 Hz, three-phase WYE (Y) split into three 120 volts single-phase circuits (SM-D-593252 (AN/ASM-189A) or SM-D-5983535 for AN/ASM- 190A).

APPENDIX A
REFERENCES

A-1. Technical Manuals

NOTE

Refer to DA PAM 25-30 for complete titles of Technical Manuals listed in tables 2-1 and C-1.

FM 11-487-4	Installation Practices: Communication Systems Grounding, Bonding, and Shielding.
FM 11-490-9	Communications-Electronics Facilities Grounding, Bonding and Shielding.
TM 11-5895-1012-10	Operator's Manual Technical Control Facility
TM 5-6115-365-15	Operator's, Organizational, Direct Support, General Support and Depot Maintenance Manual (Including Repair Parts and Special Tools List): Generator Sets, Gasoline and; Diesel Engine Driven, Trailer Mounted PU-236A/G, PU-236/G (NSN 6115-00-393-1709), PU-236B/G (6115-00-738-6334,), PU-253A/U, PU-253/U (6115-00-697-2402), PU-304C/MPQ-4 (6115-00-056-8421), PU-332/G (6115-00-577-8471), PU-332A/G (6115-00-738-8336), PU-375A/G, PU-375/G (6115-00-753-2231), PU-375B/G (6115-00-931-6789), PU-401/M (6115-00-823-2217), PU-402/M (6115-00-722-3760), PU-406/M (6115-00-738-6342), PU-409/M (6115-00-702-3343), PU-409/M (6115-00-733-6338), PU-495/G (6115-00-823-2218), PU-551/G (6115-00-889-1307), PU-564A/G (6115-00-728-6341), PU-564B/G (6115-00-179-27XX), PU-617/M (6115-00-738-6335), PU-618/M (6115-00-738-6337), PU-619/M (6115-00-738-6339),PU-620/M (6115-00-738-6340), PU-625/G (6115-00-837-3915), PU-628/G (6115-00-087-0873), PU-620/G (6115-00-937-5555), PU-631/G (6115-00-059-5172), PU-665/G (6115-00-939-3296), PU-650B/G (6115-00-258-1622).
TM 5-6115-584-12	Operator and Organizational Maintenance Manual for Generator Set, Diesel Engine Driven, Tactical Skid Mtd, 5 KW, 1 Phase, 2 Wire; 1 Phase, 3 Wire; 3 Phase, 4 Wire; 120,120/240 and 120/208 V (DoD Model MEP-002A) Utility Class, 60 Hz (NSN 6115-00-465-1044).
TM 5-6115-585-12	Operator and Organizational Maintenance Manual for Generator Set, Diesel Engine Driven, Tactical Skid Mtd, 10 KW, 1 Phase, 2 Wire; 1 Phase, 3 Wire; 3 Phase, 4 Wire; 120,120/240 and 120/208 V (DoD Model MEP-003A) Utility Class, 60 Hz (NSN 6115-00-465-1030).
TM 750-5-32	Army Equipment Data Sheets: Generator Sets and Electric Power Plants, Truck and Trailer Mounted.

*A-2. Military Specifications

MIL-C-15987C	Military Specification: Cable Assembly, Power, Electric (with Grounding, for Portable Equipment, Shipboard Use).
MIL-C-3432B	Military Specification: Cable and Wire, Electrical (Power and Control; Flexible and Extra Flexible, 300 and 600 Volts).

∗These documents are available from Command or Depot libraries.

***A-3. Military Standards**

MIL-STD-188-24	Grounding, Bonding, and Shielding for Common Long Haul/Tactical Communications Systems.
MIL-STD-454	Safety Requirements (Personnel Hazard) for Electronic Equipment.
MIL-STD-633E	Mobile Electric Power Engine-Generator Standard Family General Characteristics.
MIL-STD-686A	Cable and Cord, Electrical: Identification Marking and Color Coding of.
MIL-STD-1856(EL)	Grounding, Bonding and Shielding Design Practices.
MIL-STD-1857(EL)	Grounding, Bonding and Shielding Design Practice.

***A-4. Miscellaneous References**

ANSI-CI-1978	National Electrical Code.
DL-SC-B-883856	Data List: Cable Assemblies, Electrical Power, 40A, 60A, 100A, and 200A.
NFPA-70-1978	National Electrical Code.
DA PAM 738-750	Maintenance Management Update.

*These documents are available from Command or Depot libraries.

APPENDIX B
POWER CABLE TECHNICAL DRAWINGS

B-1. Scope

This appendix contains illustrations of electrical cables referenced by figure number in chapter 2, table 2-1. These cables are used to connect the equipment listed in column one of the table to mobile gasoline- or diesel-engine- powered generators. Each figure is made up of a cable wiring diagram and an outline drawing of the cable's exterior. The wiring diagrams label each cable conductor color and identify associated connector contacts or terminals by letter or number, as appropriate.

B-2. Usage

The figures in this appendix identify cable assemblies by nomenclature when such nomenclature is available. Cables for which nomenclature is not available are identified by their associated engineering drawing number. All of the engineering drawings specified in this appendix bear the identification code number 80063 indicating they were generated under the authority of U.S. Army Communications and Electronics Materiel Readiness Command Logistics Engineering Directorate, Ft. Monmouth, NJ. Refer to figures B-1 thru B-33, as necessary, for additional information when utilizing the generator hookup diagrams in chapter 2.

B-3. Continuity Check

Before using a new or replacement power cable for the first time, inspect the cable closely for signs of damage or unauthorized repair. Check available maintenance records to determine if the cable has undergone authorized repair or replacement of connectors. If either condition is noted, refer to the applicable figure in this appendix and perform a continuity check to insure that the cable is wired correctly. Test each cable conductor for continuity between associated connector contacts. Verify that there are no open conductors or shorts between conductors. Make certain there is no continuity between power-carrying conductors and connector shells.

B-4. Insulation Damage

Insulation on exposed conductors of cable stubs and pigtails is prone to deterioration caused by moisture, temperature extremes, ultraviolet light, and repeated handling. If the color of the insulation on a conductor has faded beyond recognition, the stub or pigtail must be replaced. Insulation that has deteriorated to such a degree should be considered suspect. It may no longer be capable of protecting equipment and personnel from dangerous electrical shorts.

B-5. Color Coding

If it becomes necessary to add or to change color coding on conductors, the materials listed below are available for this purpose:

Black wire marker tape 1/2 x 1296 in. (12.7 mm x 33 mm)	5970-00-689-3444
Blue wire marker tape 1.2 x 240 in. (12.7 mm x 6 m)	5970-01-017-7388
Green wire marker tape 1/2 x 240 in. (12.7 mm x 6 m)	5970-01-013-9366
Red wire marker tape 1/2 x 240 in. (12. mm x 6 m)	5970-00-834-2569
White wire marker tape 1/2 x 648 in. (12.7 mm x 16 m)	5970-00-832-4299
Red wire tags	9905-00-537-8954
Yellow wire tags	9905-00-537-8955
Green wire tags	9905-00-537-8956
White wire tags	9905-00-537-8957

Remember to perform continuity checks, as necessary, to insure that each conductor is marked in accordance with the technical drawings in this appendix or the National Electrical Code (NEC), as applicable. The NEC specifies that the grounded conductor shall have an outer identification of a white or natural gray color. (In the generator hookup diagrams in this TB, the grounded conductor is always the neutral conductor.) Equipment Grounding Conductors (EGCs) may be bare, covered or insulated. Covered or insulated EGC's must be color-coded green or green with yellow stripes. As a general rule, the ungrounded conductors, or hot conductors, in Army equipment are colored black, red, and blue, respectively, for the three phases. When color coding conductors, the identifying colors must be applied at every point where the conductor is accessible.

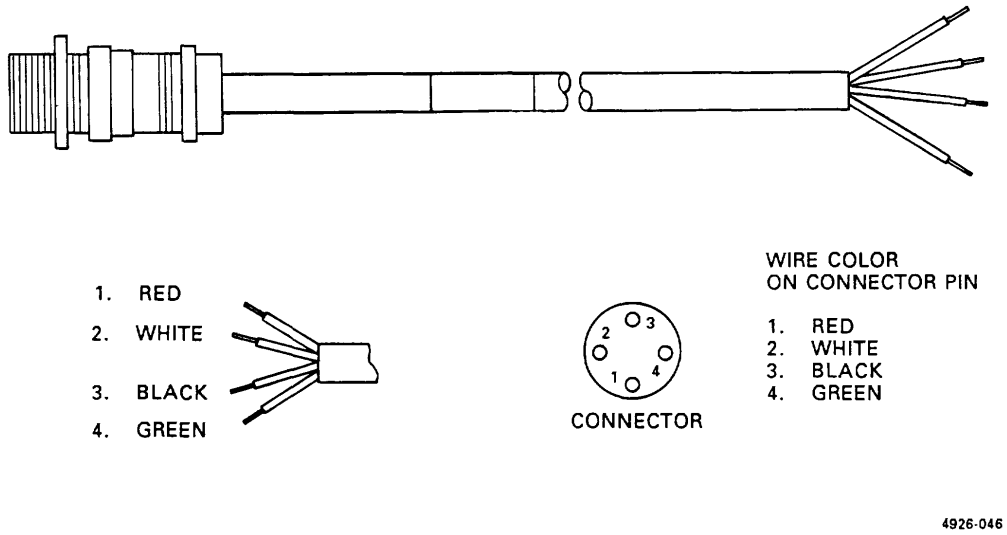
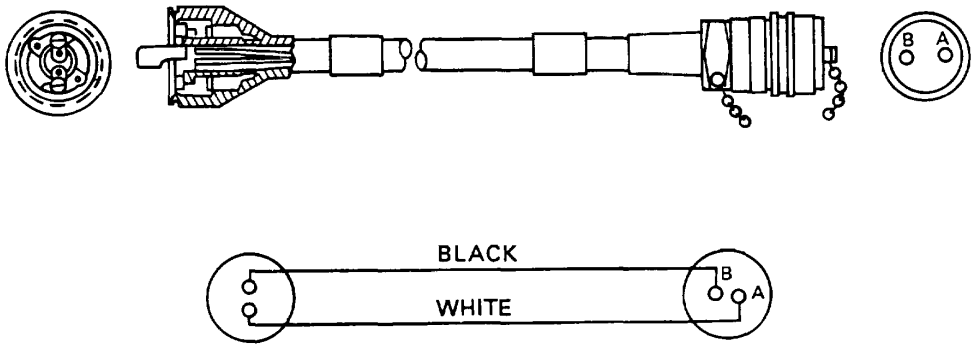
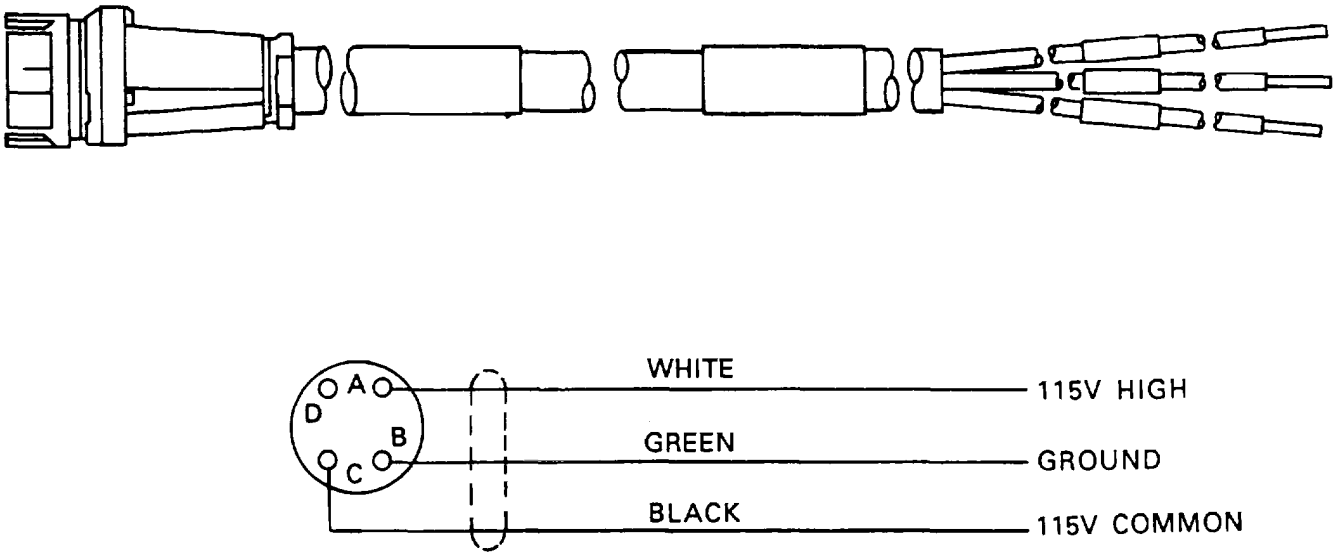


Figure B-1. Cable Assembly SM-D-593252 or SC-D-593535.



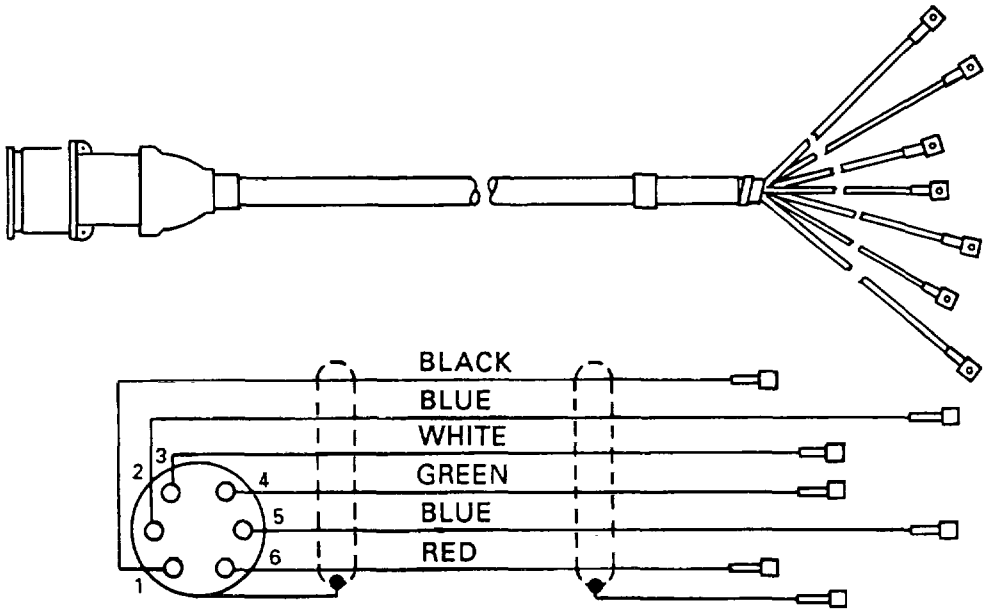
4926-047

Figure B-2. Cable Assembly CX-2043/U, drawing number SC-D-93578.



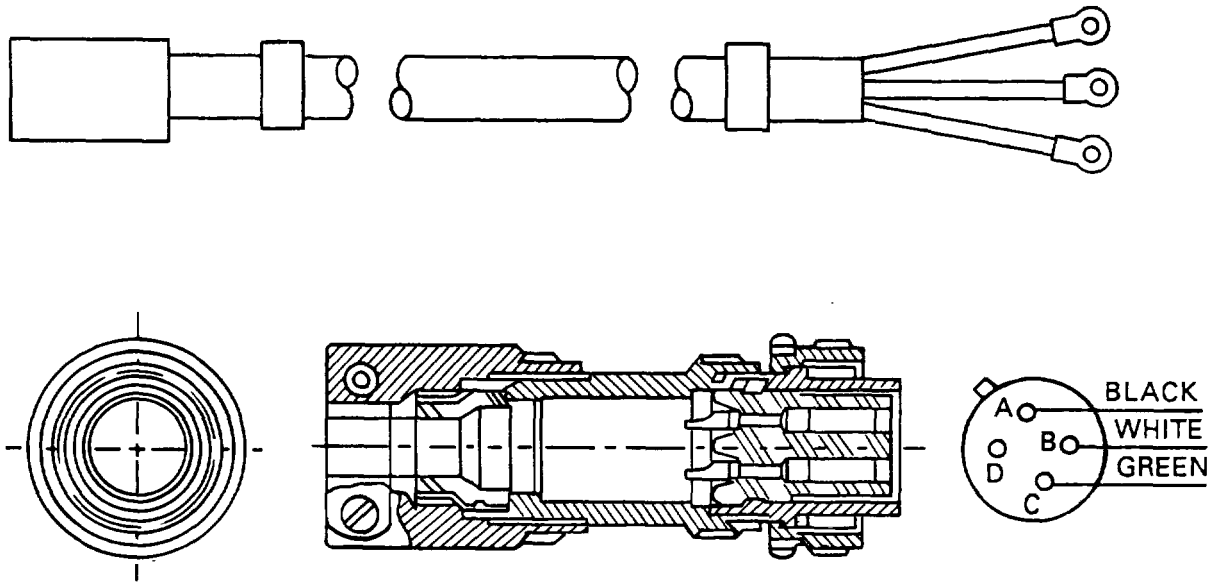
4956-048

Figure B-3. Cable Assembly CX-4686/U,drawing number SM-D-422981.



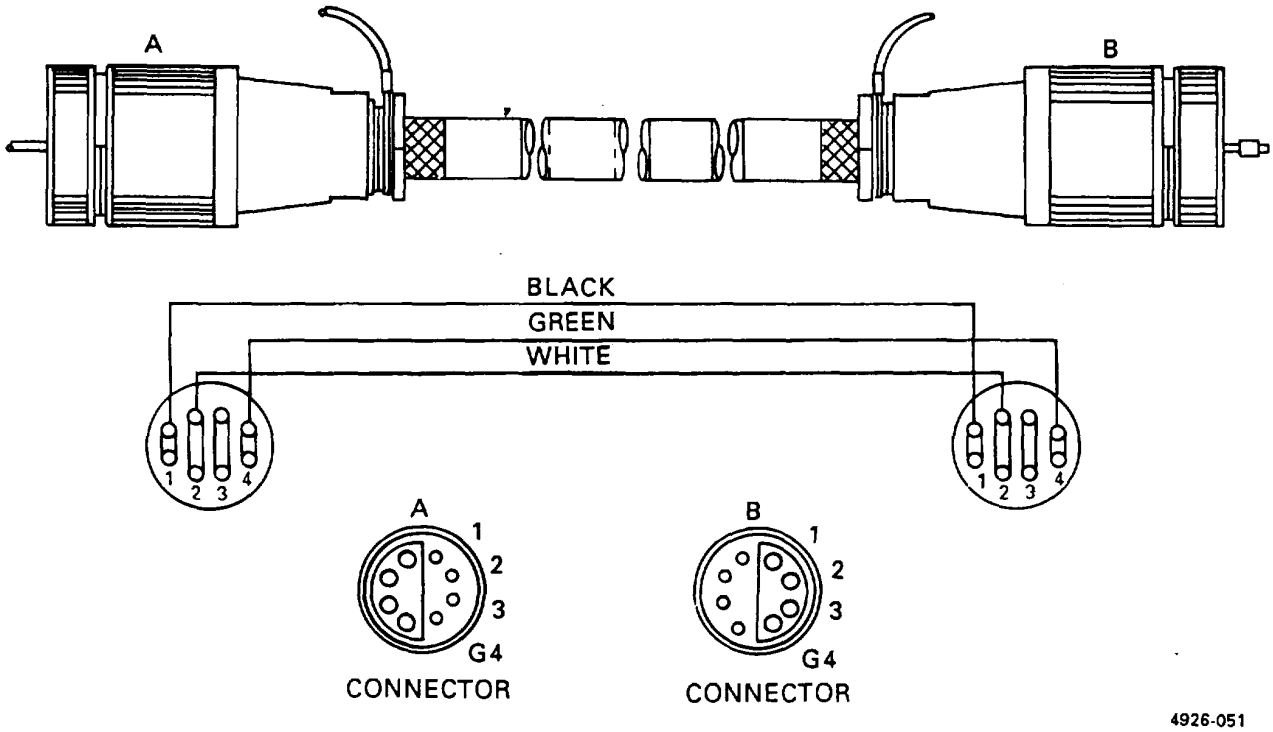
4926-049

Figure B-4. Cord CO-316, drawing number SC-D-26552.



4926-050

Figure B-5. Cable Assembly CX-10951/G, drawing number SM-C-612898.



4926-051

Figure B-6. Cable Assembly CX-7453A/U, drawing number SM-D-352142.

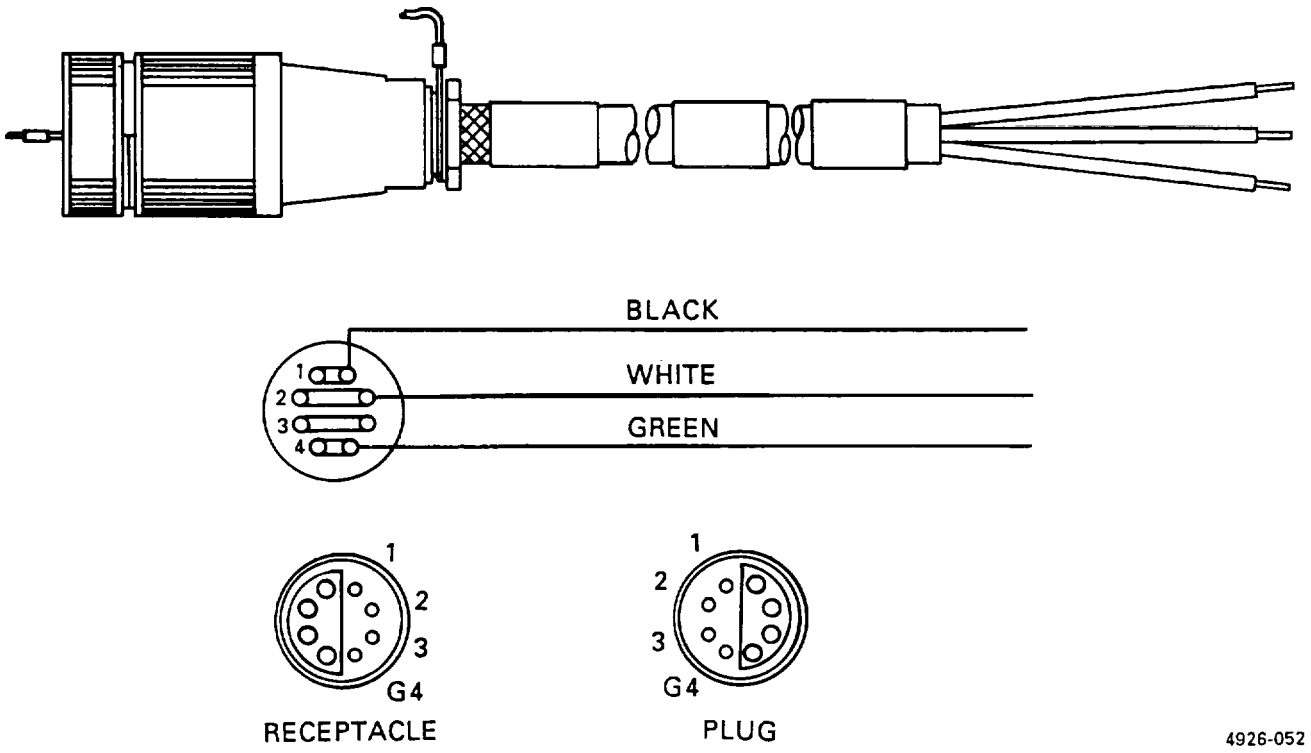


Figure B-7. Cable Assembly CX-7705A/U (stub), drawing number SM-D-352157.

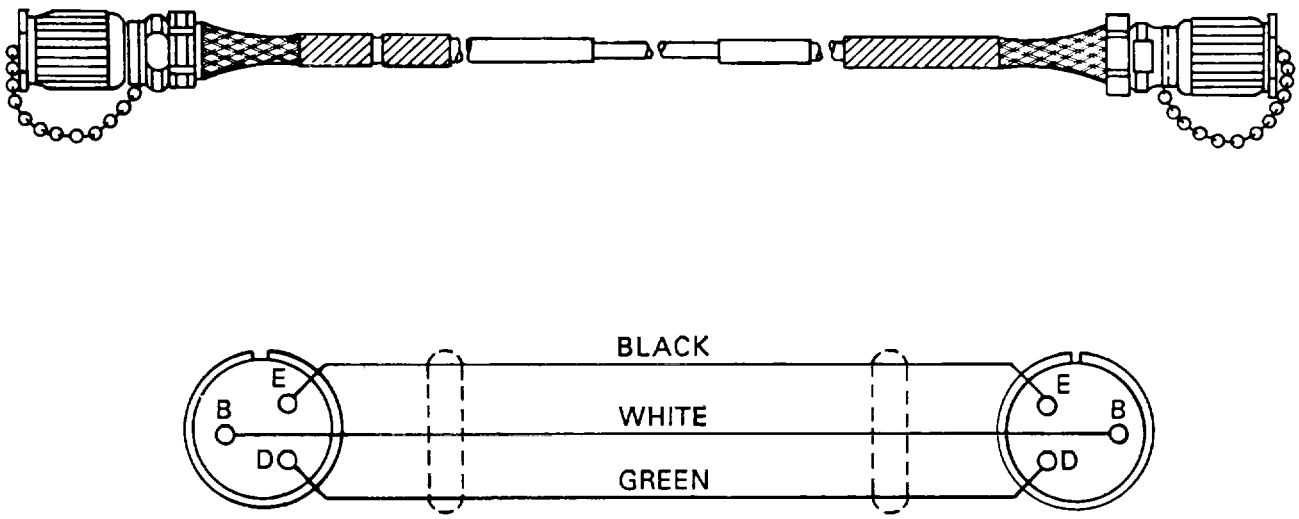
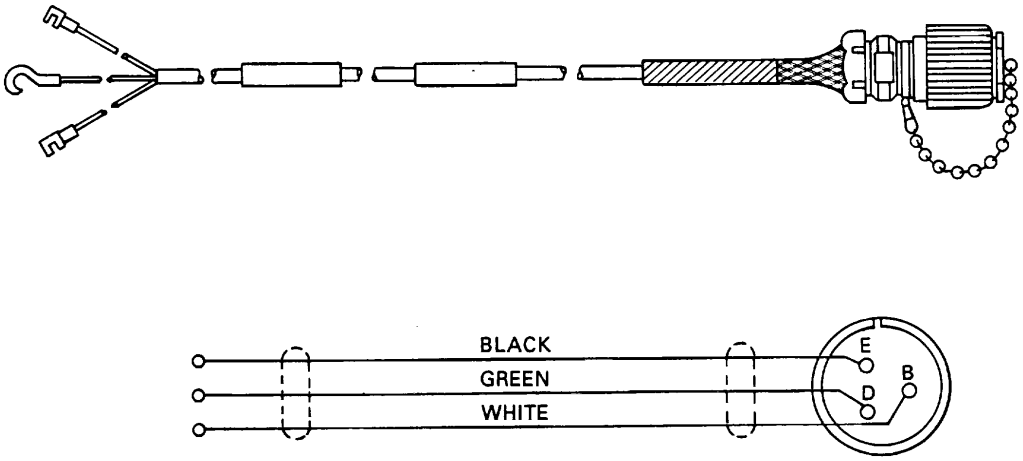


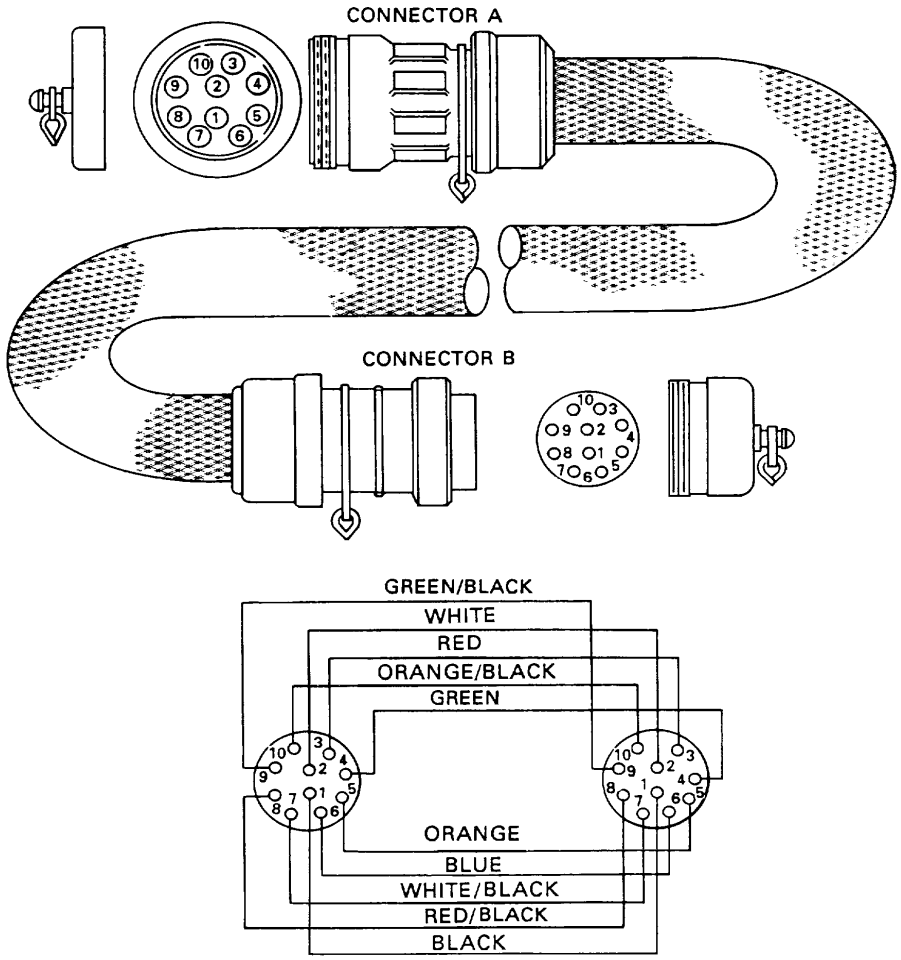
Figure B-8. Cable Assembly CX-4694C/U, drawing number SC-D-374107.



4926-054

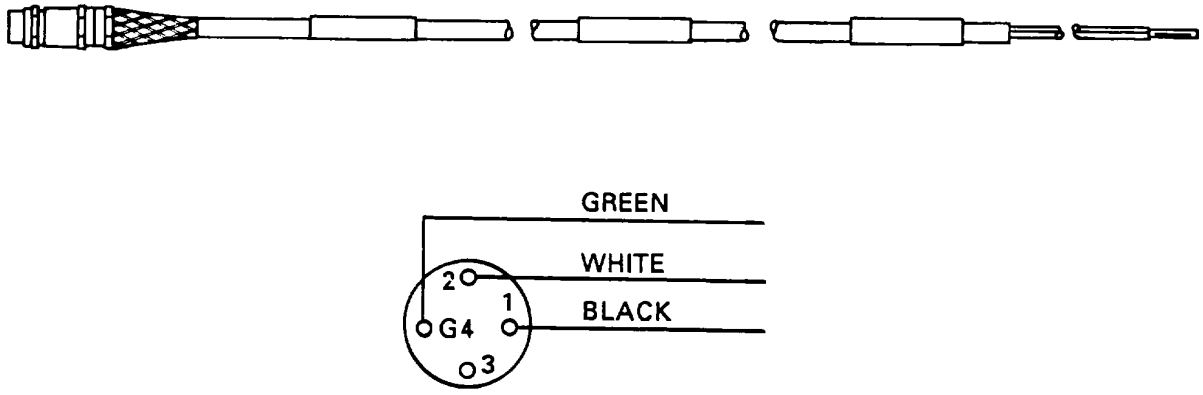
Figure B-9. Cable Assembly CX-4693C/U (stub), drawing number SC-D-374106.

P701 PIN NO.	COLOR	P1001 PIN NO.
1	BLACK	1
2	WHITE	2
3	RED	3
4	GREEN	4
5	ORANGE	5
6	BLUE	6
7	WHITE-BLACK	7
8	RED-BLACK	8
9	GREEN-BLACK	9
10	ORANGE-BLACK	10



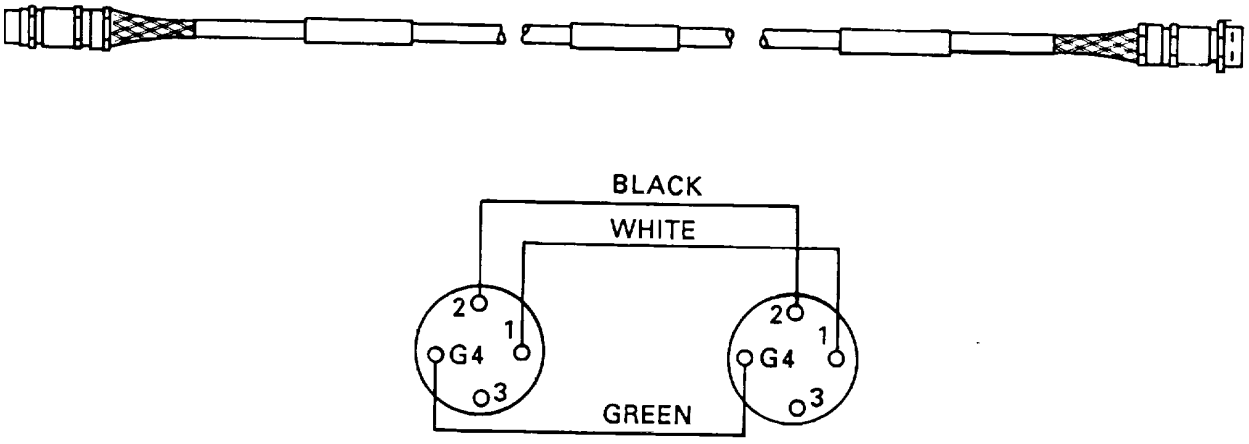
4926-055

Figure B-10. Cable Assembly CX-2771/U, drawing number SM-C-332367.



4926-056

Figure B-11. Cable Assembly SC-C-622029, drawing number SC-C-622029.



4926-057

Figure B-12. Cable Assembly SC-C-622028, drawing number SC-C-622028.

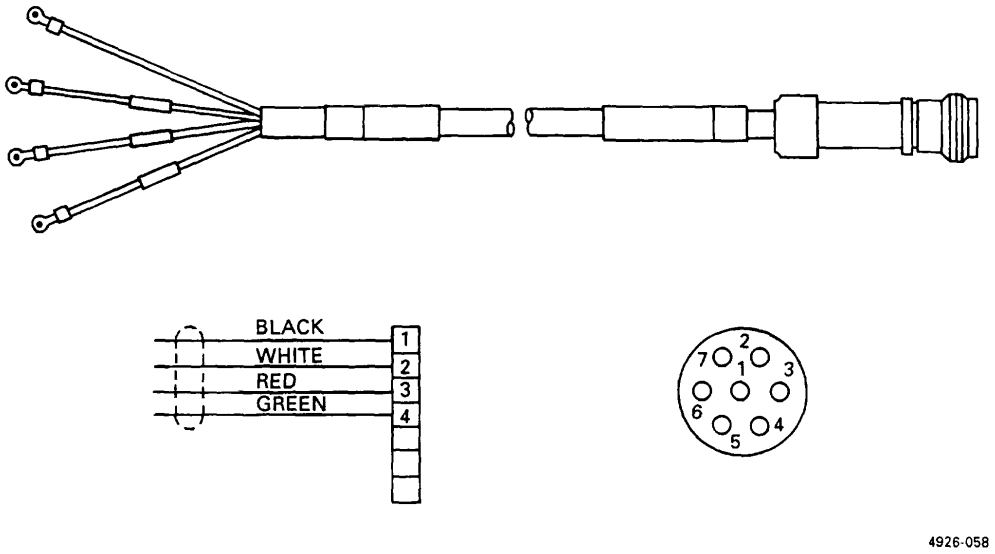


Figure B-13. Cable Assembly C-11081/U, drawing number SM-D-497-639.

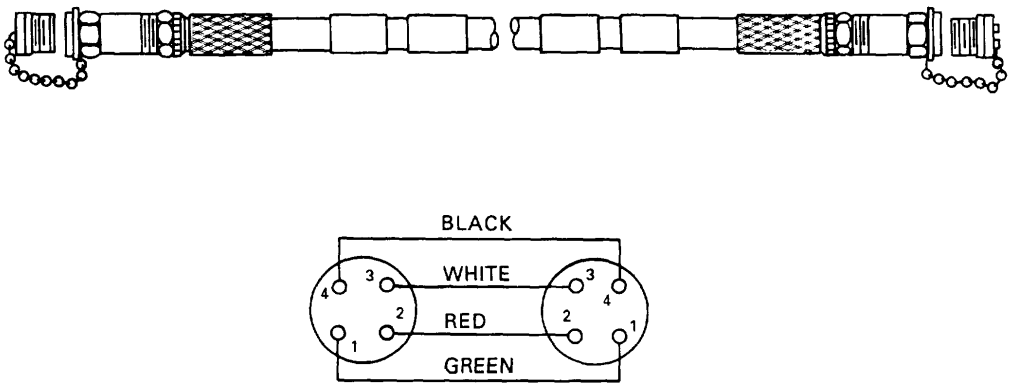
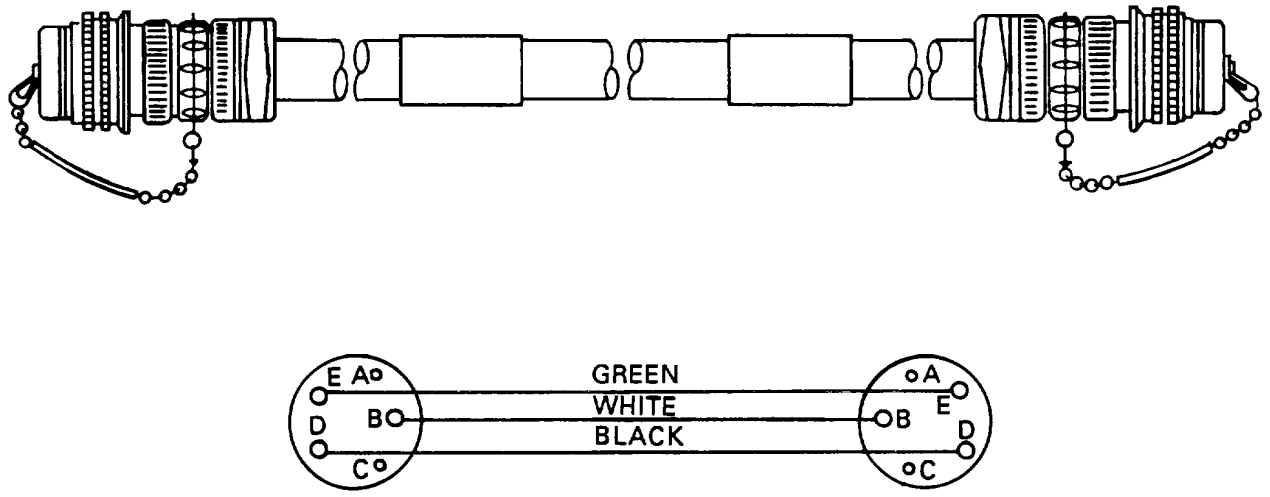
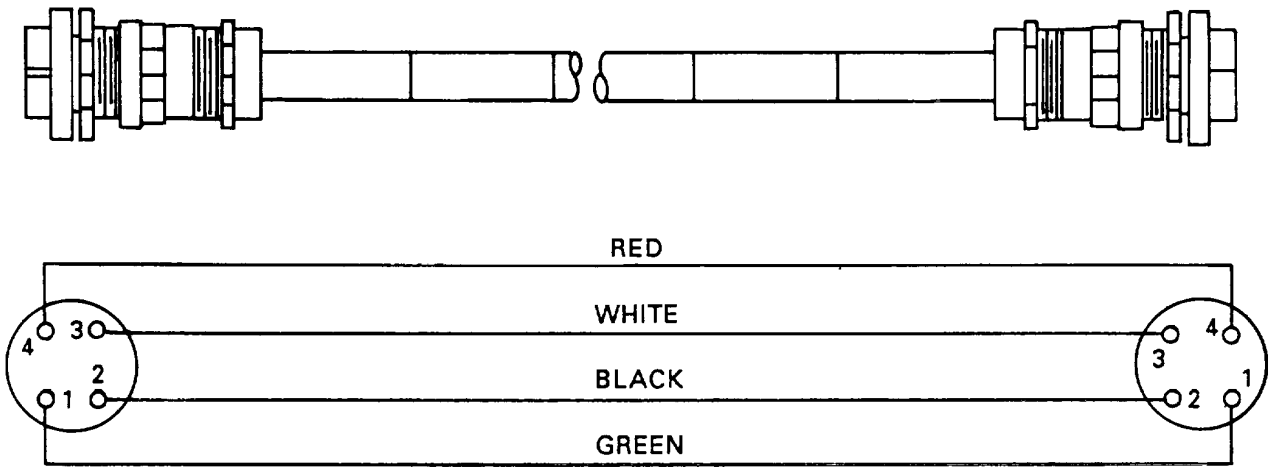


Figure B-14. Cable Assembly CX-12022/U, drawing number SM-C-642209.



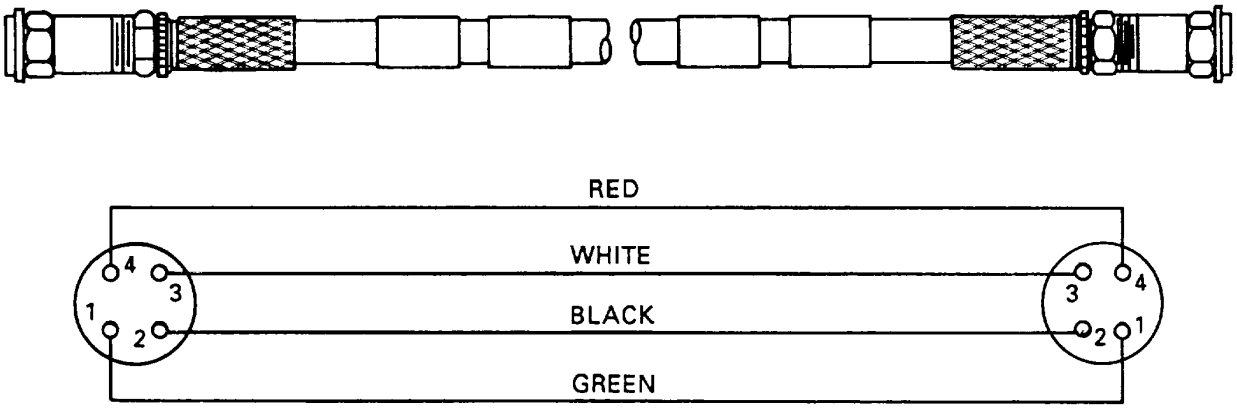
4926-060

Figure B-15. Cable Assembly CX-2440/U, drawing



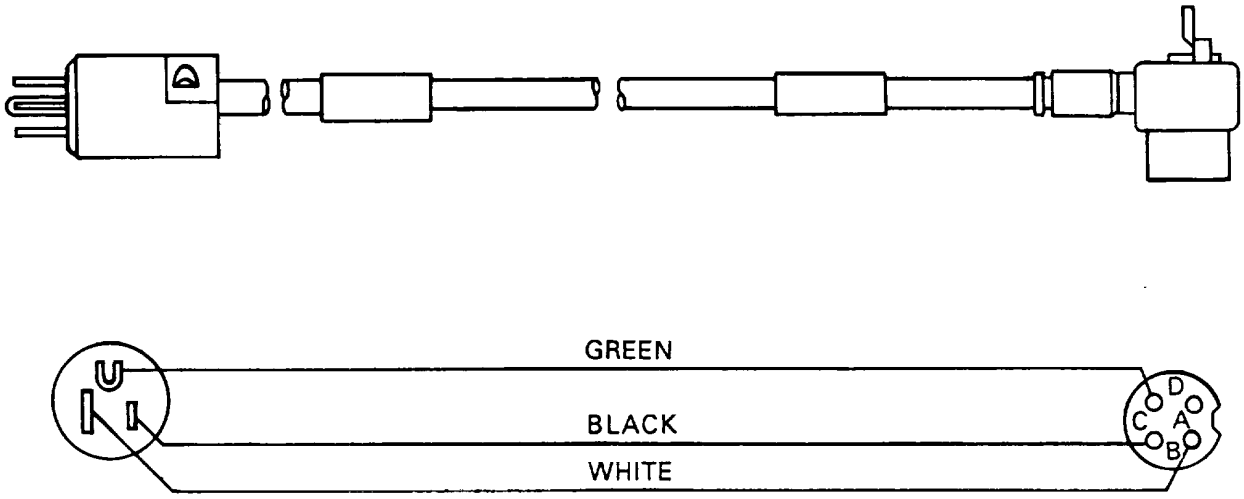
4926-061

Figure B-16. Cable Assembly SC-D-630304, drawing number SC-D-630304.



4926-062

Figure B-17. Cable Assembly SC-D-602436.



4926-063

Figure B-18. Cable Assembly CX-11948/U, drawing number SM-D-643196.

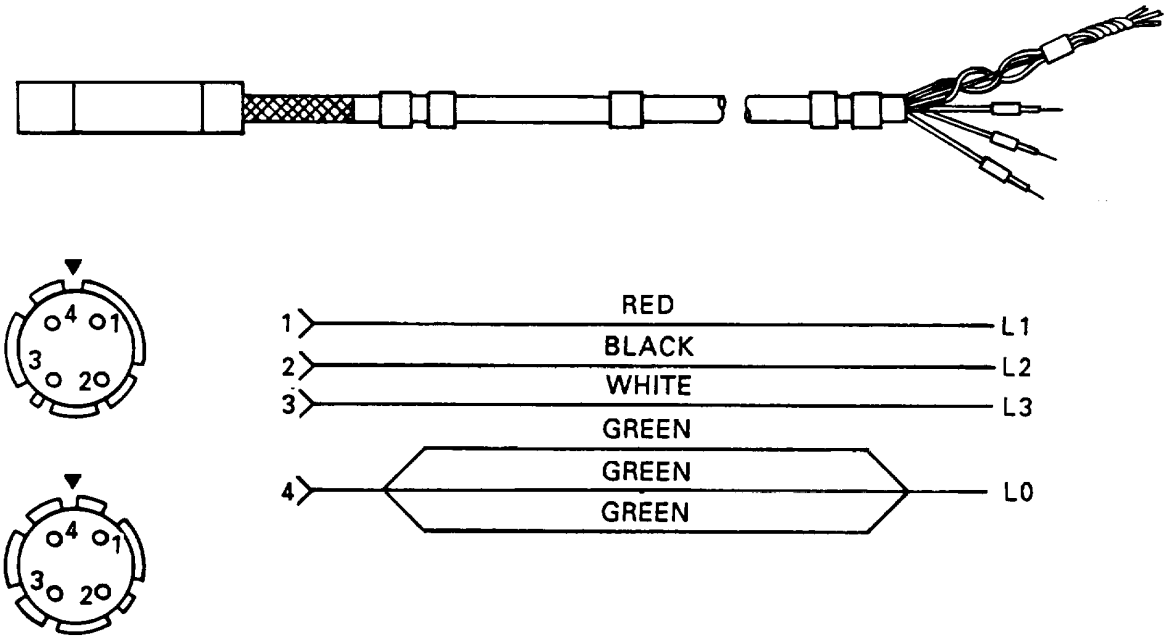


Figure B-19. Cable Assembly CX-11282/TSC-26 and CX-11283/TSC-26, drawing number SM-C-537688.

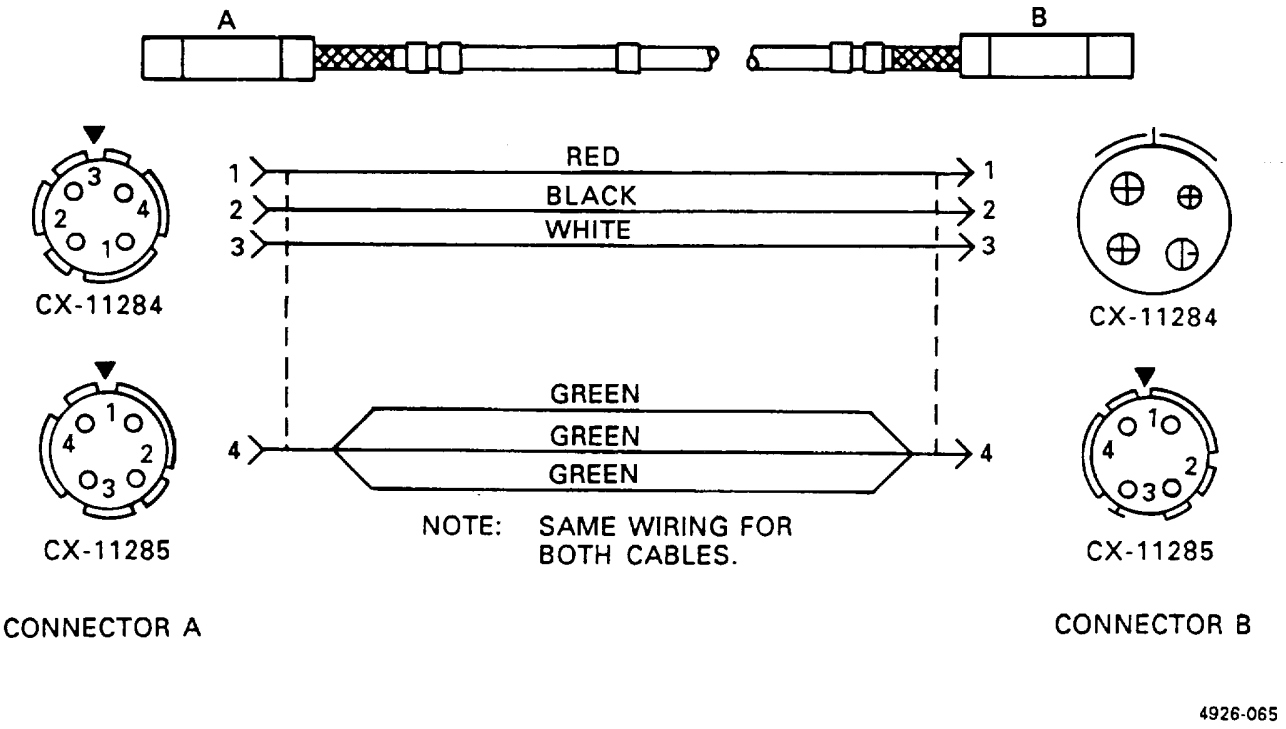
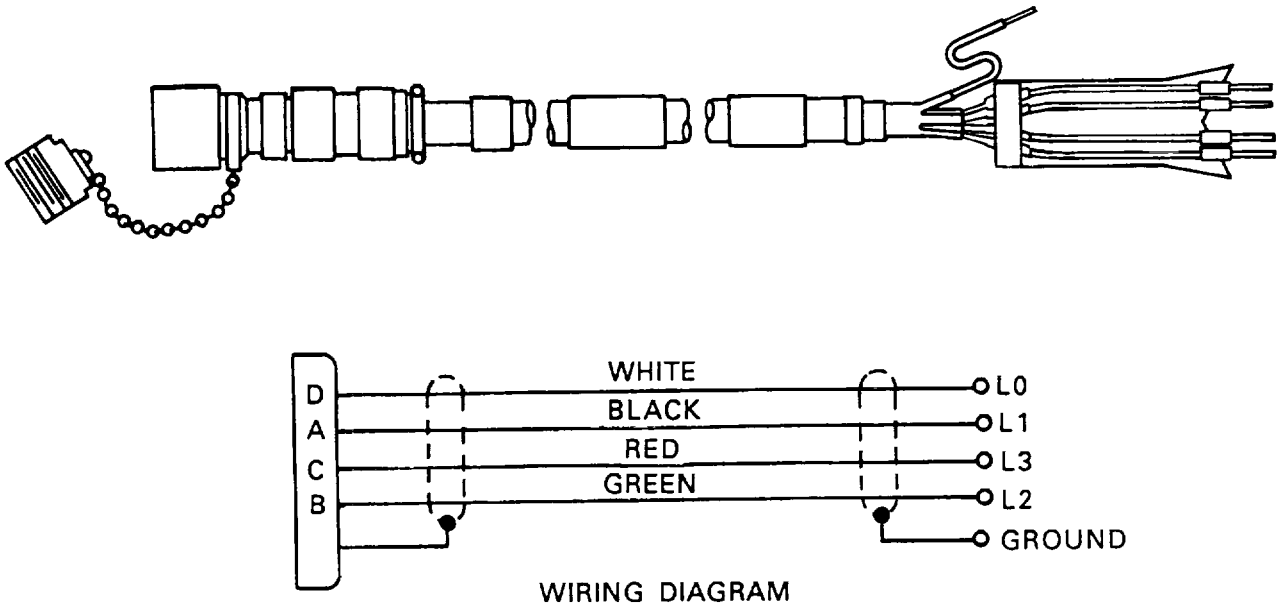
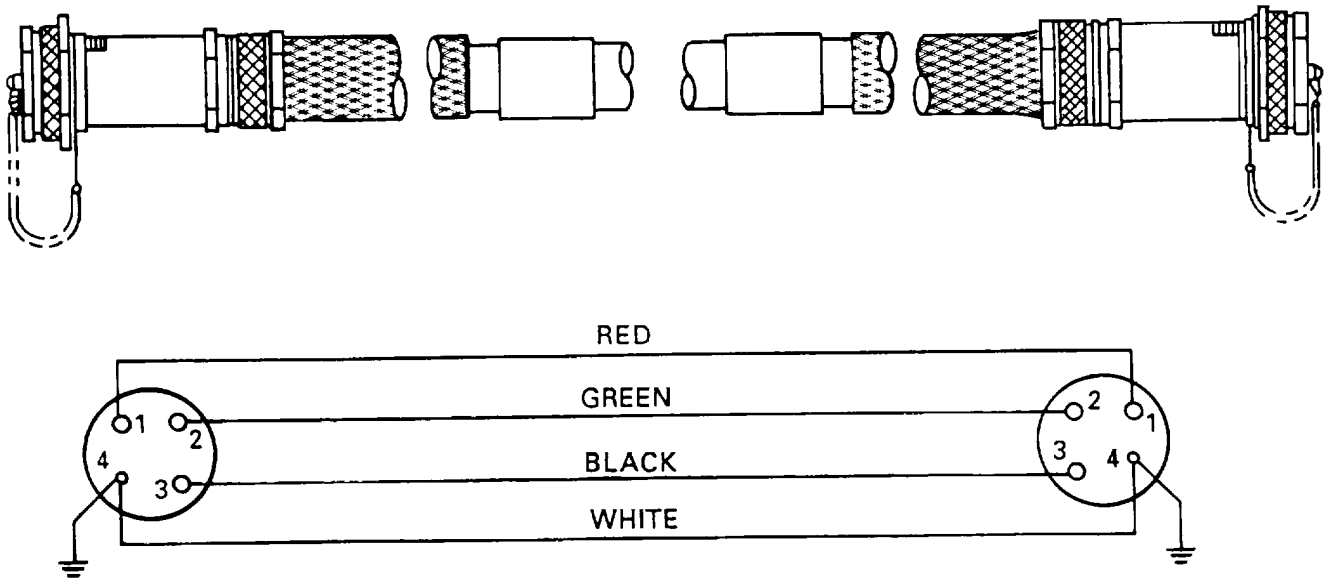


Figure B-20. Cable Assembly CX-11284/TSC-26 and CX-11285/TSC-26. drawing number SM-C-537687.



4926-066

Figure B-21. Cable Assembly CX-10467/TSC-54, drawing number SM-D-571926.



4926-067

Figure B-22. Cable Assembly CX-12150/TSQ-43A, drawing number SM-D-688552.

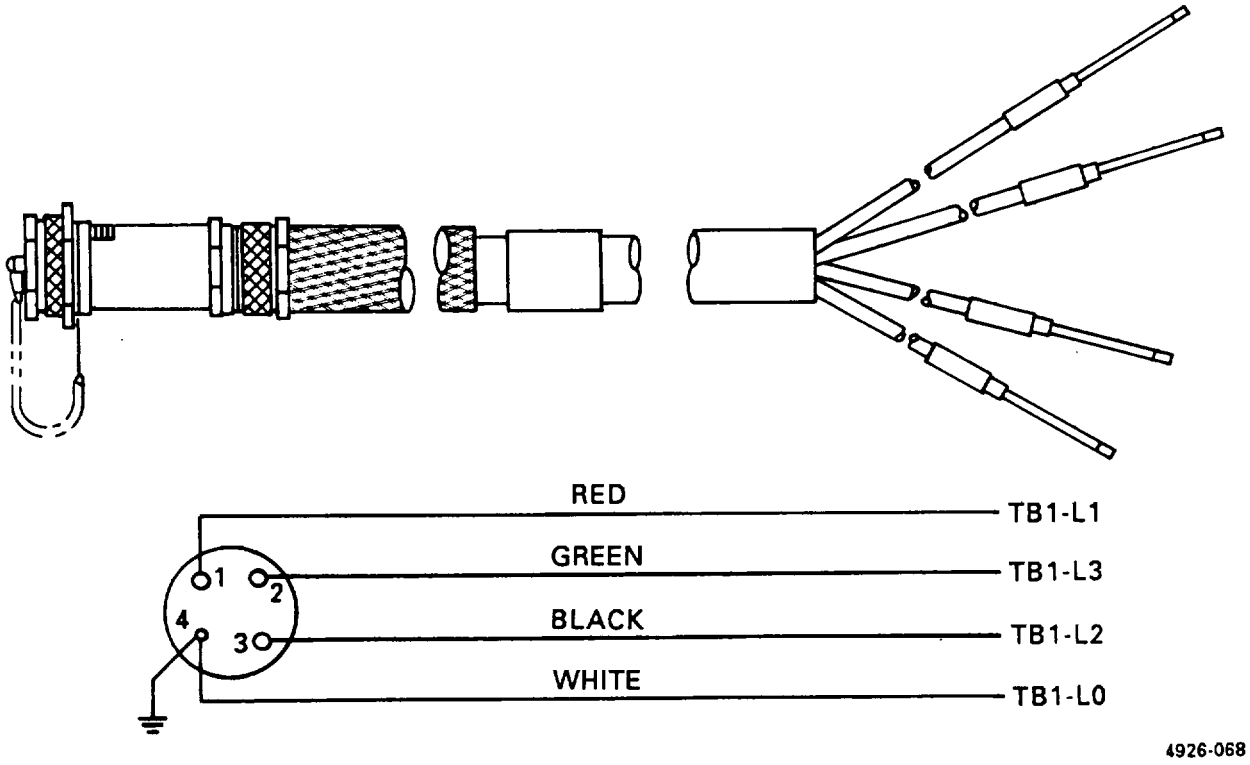


Figure B-23. Cable Assembly CX-12160/TSQ-43A, drawing number SM-D-688553.

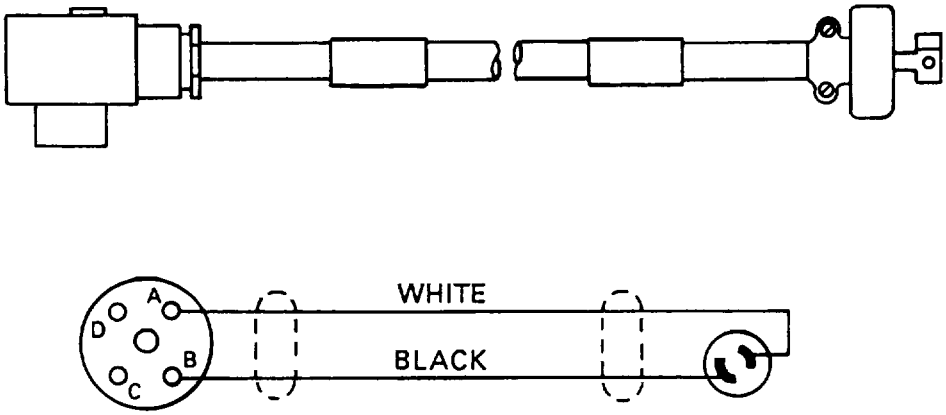
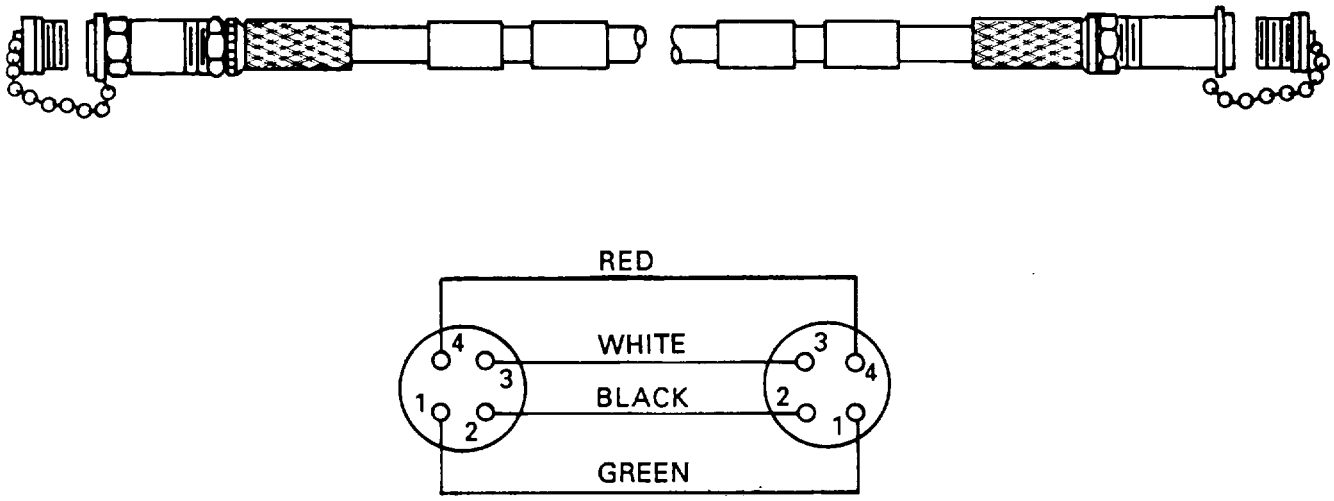
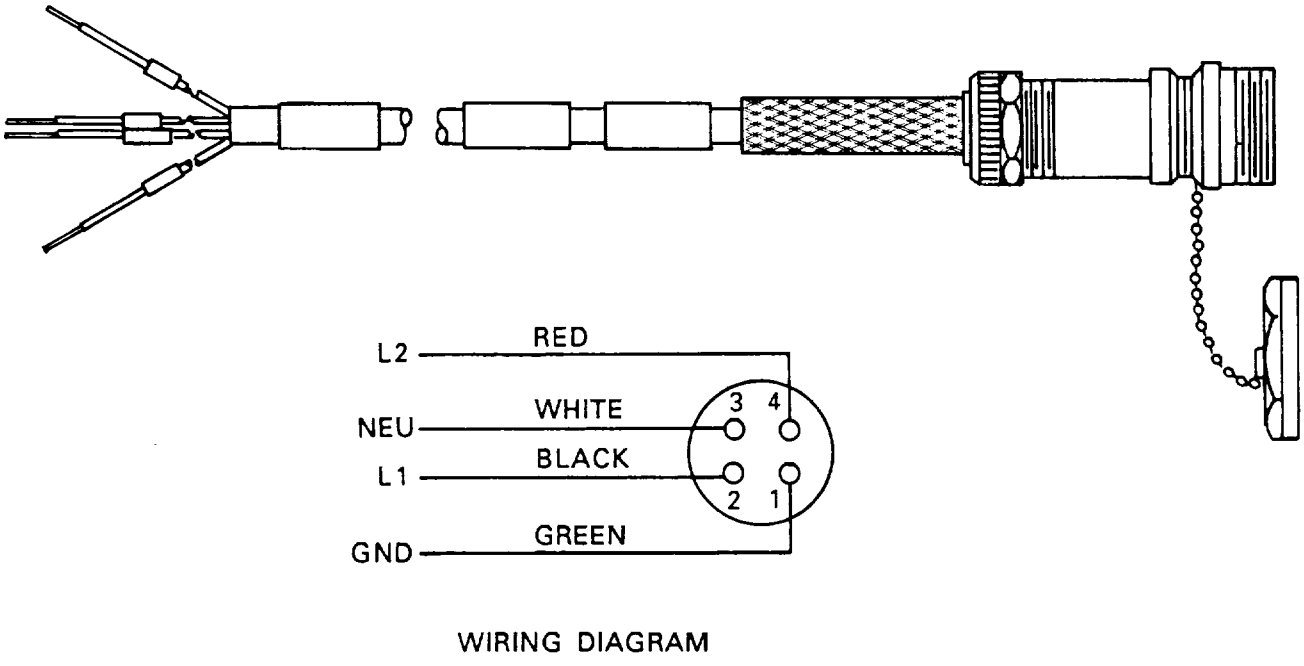


Figure B-24. Cable Assembly CX-4881/U, drawing number SM-D-345266.



4926-070

Figure B-25. Cable Assembly SC-D-861681.



4926-071

Figure B-26. Cable Assembly SC-D-861646.

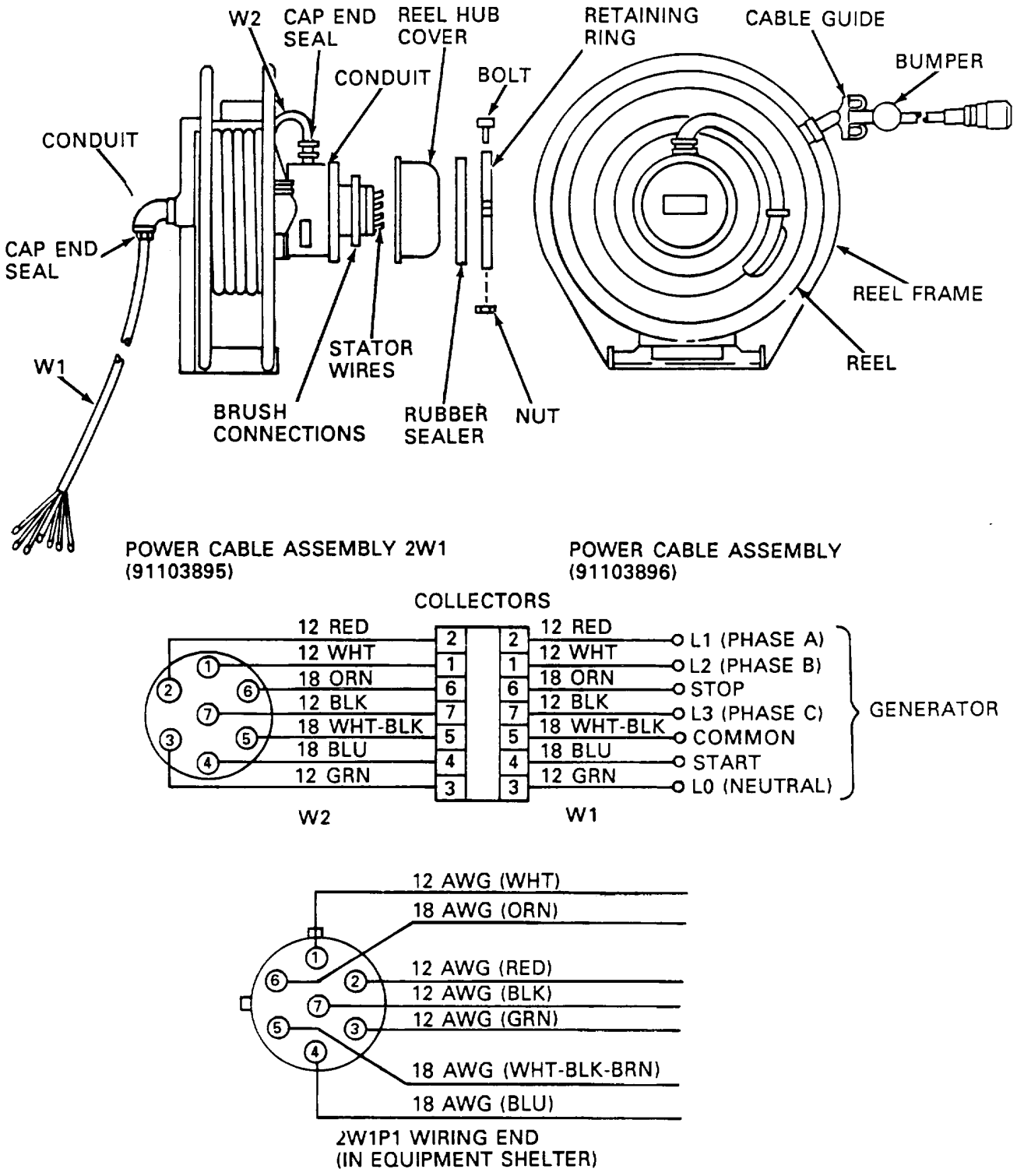
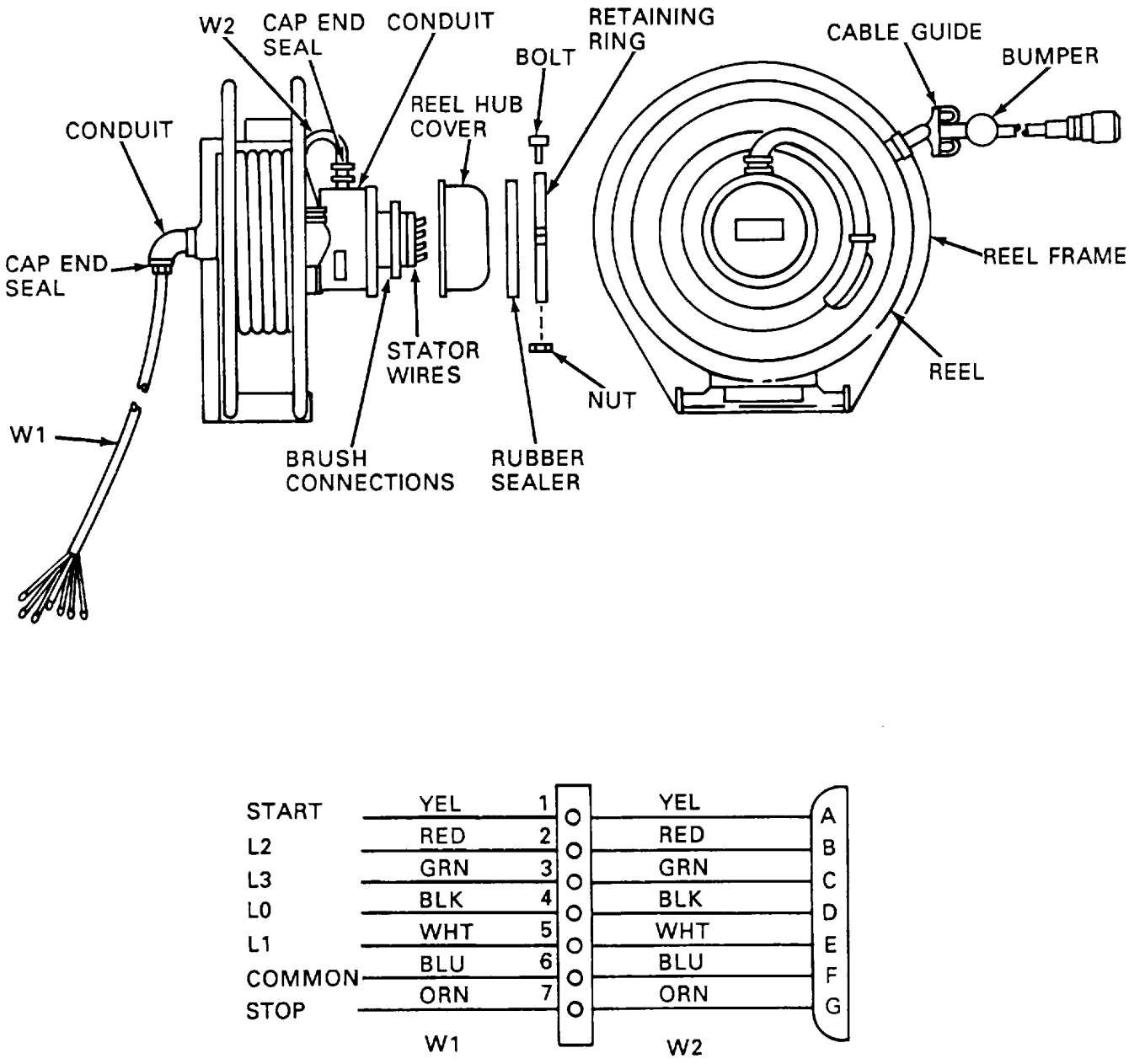
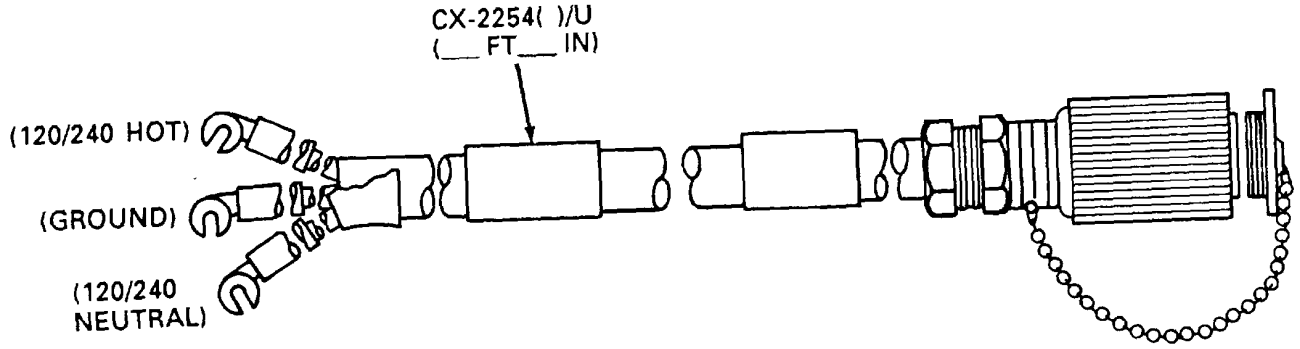


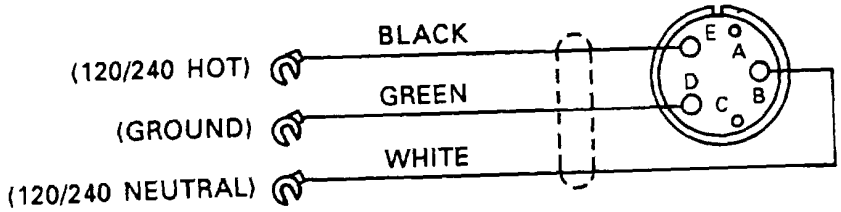
Figure B-27. Power Cable Assembly LM 91103672 on Reel Unit RL-280 (P/O AN/GLQ-3).



4926-073

Figure B-28. Power Cable Assembly for AN/TLQ-15 on Reel Unit RL-260

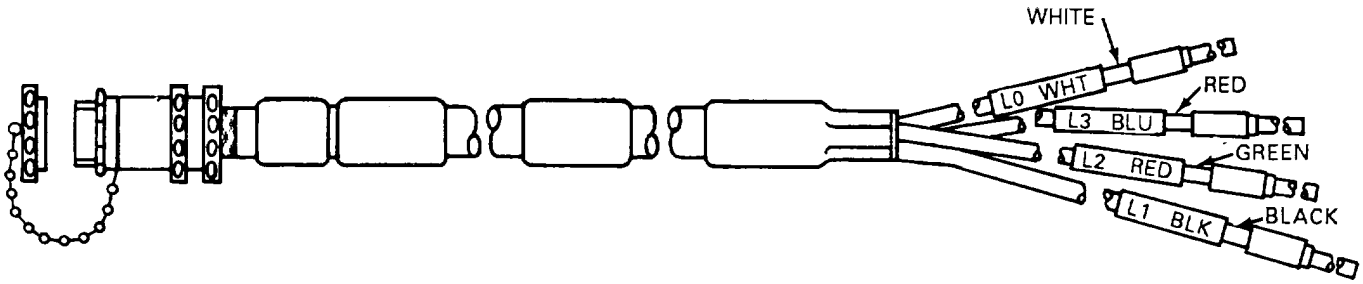


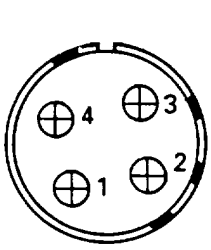


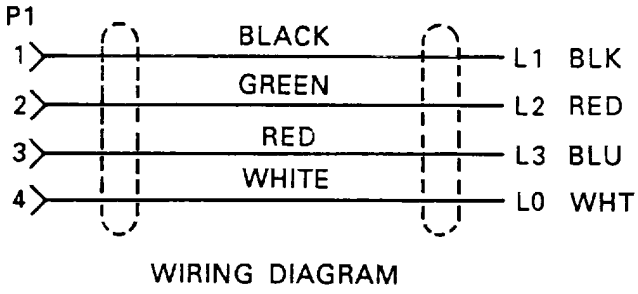
WIRING DIAGRAM

4926-074

Figure B-29. Cable CX-2254 Stub.







WIRING DIAGRAM

4926-075

Figure B-30. Cable Assembly SM-D-744664 (25 ft.).

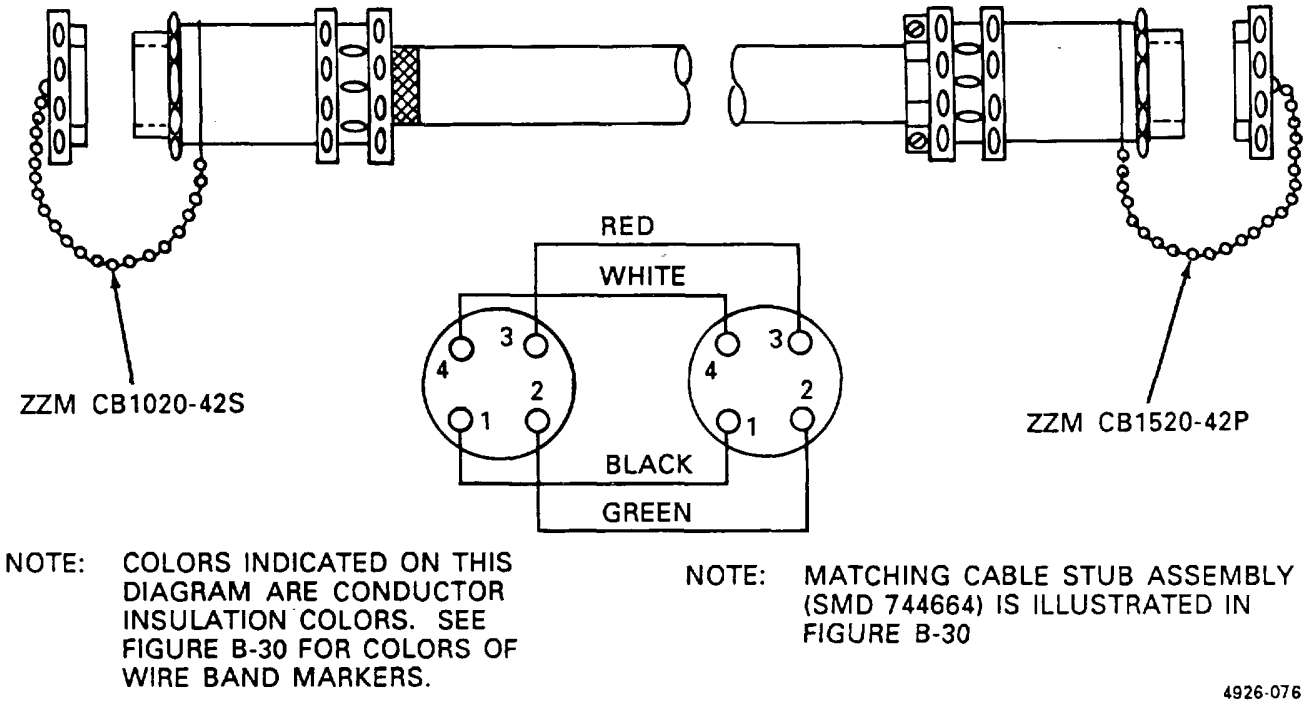


Figure B-31. Cable Assembly SM-D-744663.

APPENDIX C
STANDARD GENERATOR INFORMATION AND PRIMARY POWER SYSTEM PLANNING

Section I. STANDARD GENERATOR INFORMATION

C-1. General

The data in table C-1 is compiled from TM 5-6115-365-15, TM 750-5-32, and MIL-STD-633-D. Use this data to select power generation equipment with sufficient output capability to match the power requirements of your equipment. The designation MEP which appears in the table refers to self-contained, skid-mounted, engine- driven, portable generator sets equipped with controls, instruments, and accessories. When mounted on a trailer to provide maximum mobility, the entire assemblage is referred to as a power unit (PU). The designation MJQ prefixing a number identifies a power plant. A power plant can be either two generator sets mounted on a single trailer or two power units issued as a single end item. In either configuration, the two generator sets involved are interconnected through a power transfer switch box. The equipment to be powered is then, in turn, connected to the outputs on the power transfer switch box. Using the switches or circuit breakers on the power transfer switch box, the operator can select the generator set supplying power to the load. Some power plants have the capability of operating in parallel. In parallel operation, the output of both generator sets running in tandem is applied to the load through the power transfer box. Parallel operation requires two or more generator sets of the same size, class, and mode synchronized with each other through a specialized set of auxiliary cables supplied for this purpose.

C-2. Use of Table C-1 in Selection of Power Generation Equipment

The following steps demonstrate, through example, the use of table C-1 in selecting appropriate power generation equipment for a particular end item. Reference must be made where shown to table 2-1 in chapter 2 of this TB.

a. Refer to table 2-1 column one, Equipment Nomenclature, and locate equipment to be powered, as an example, AN/GRC-41 Radio Set. Locate AN/GRC-41 and note that in column three, Power Required, the table specifies 3 KW, 120V, 60 HZ.

b. Refer to table C-1, column two, Description, and compare capabilities of the individual generator sets with the power requirements determined in step a. Note that MEP016A is a 60 Hz generator set rated at 3 KW. Looking across to column four, Power Unit/Power Plant Configurations, we find a list of the mobile power generation equipment utilizing this particular generator set.

c. Refer back to table 2-1, under Generator Hookup, to locate the figure number of illustration in chapter 2 showing how AN/GRC-41 is connected to power generation equipment.

WARNING

Do not connect any power generation equipment unless and until you have read and understood all of the safety precautions in chapter 1, section II of this TB. Pay particular attention to the grounding connections and methods contained in this material. Operating improperly grounded power generation equipment could result in serious injury or death through electrocution.

d. If your equipment is not listed in table 2-1, refer to applicable technical manual to determine equipment power requirements and cabling instructions. If necessary, refer to DA Pam 25-30 for help in identifying the most recent edition of the technical manual for your equipment.

Section II. PRIMARY POWER SYSTEM PLANNING

C-3. General

The information provided in section I is intended to assist you in selecting compatible power generation equipment for a single end item of electronic equipment. If there are several shelter-mounted equipments deployed at a worksite it may be practical to use a single, centralized power plant/unit to power them all. Lower fuel consumption, less noise, and less maintenance are a few of the benefits to be gained from using one large power source rather than several smaller ones. Not all generator sets, however, are suitable for use as prime power sources and special precautions and planning must be observed when using this system of power generation and distribution . The paragraphs which follow describe some of the points to consider when planning a primary power system. The sample system below is based on the MEP006A 60 KW generator set.

C-4. Use of MEP006A Generator Set as a Prime Power Source

a. Reference to TM 5-6115-545-12 shows that the family of generator sets to which the MEP006A belongs all operate in a 3-phase Wye (Y) output configuration. Selection of either 120/208 volts-per-phase or 240/416 volts-per-phase output at 60 KW is achieved by altering position of the voltage reconnection board .

b. These generator sets can operate separate single-phase loads as long as the individual loads placed on each phase do not exceed 33% of the total output capacity of the generator. Individual 120V, single-phase loads are connected to output terminals L1 and L0, L2 and L0, and L3 and L0. Individual 208V, single-phase loads are connected to L1 and L2, L2 and L3, and L1 and L3.

c. To develop an equipment loading plan that will balance the power requirements of the work site against the output capabilities of the generator set, proceed as follows:

(1) Consult table 2-1 in chapter 2 and determine which single-phase equipments share the same voltage and frequency requirements.

(2) From the KW column, determine the amount of power required by each equipment in kilowatts and then add them together to get total kilowatts of power required.

(3) Compare the total kilowatt figure calculated in step (2) with the total capacity of the generator set. Make certain that the power requirements of the equipment do not exceed the output capacity of the generator set.

(4) Divide the load among the three phases of power available. Remember that the load connected to any one of the three phases must not exceed 33% of the total generator set capacity. For example: if the total capacity is 60 KW, the maximum load applied to a single phase must not exceed 19.8 KW.

d. The following example shows how a loading plan would be developed for the MEP006A 60 KW generator set. At the worksite, there are two AN/MRC-127'S, two AN/MSC-29's, and two AN/TCC-61's. Refering to table 2-1, it can be determined that each AN/MRC-127 will require 2 KW, each AN/MSC-29 will require 12 KW, and each AN/TCC-61 will require 7 KW. Adding these requirements together equals 42 KW - well within the output capability of a 60 KW generator set. Dividing the 42 KW load evenly between the three phases would result in each phase carrying a 14 KW load. Remember, if necessary, a single phase could carry 19.8 KW. By combining one AN/MSC-29 (12 KW) and one AN/MRC-127 (2 KW), in parallel, on each of two phases, a total of 14 KW has been applied to each phase. By combining the two AN/TCC-61's (7 KW each) on the remaining phase, the load is divided equally with each phase supplying 14 KW of the total power requirement. Obviously, you cannot always manage to balance the load exactly, but the portion of the load applied to each phase should be as close to being equal as possible.

CAUTION

Do not connect single-phase loads to a three-phase generator unless you are certain that the generator is capable of single-phase loading. Refer to table C-1 or DA Pam 25-30 for the applicable generator set technical manual and refer to manual for correct loading specifications. Calculate loading as described in paragraph C-4 to distribute loading evenly.

C-5. Power Cable Replacement or Fabrication

a. Power cables issued with electronic equipment as basic issue or component of end item carry a separate part number. These cables are replaced by requisition through normal channels.

b. For information on fabrication of power cables to meet specialized power distribution needs refer to DL SC-B-883856 (see appendix A).

C-6. Prime Utility Power Sources

Generator sets MEP409A and MEP208A are designated as Prime Utility power sources. In this capacity, they are both capable of producing up to 750 KW of power. The MEP409A is gasoline-engine-driven and the MEP208A is diesel-engine-driven. These units can be used in place of the Tactical Utility unit discussed in paragraph C-4 whenever the prime power requirements at a worksite exceed 60 KW.

C-7. Commercial Single Phase Power Service

Figure C-1 illustrates a typical power service box supplying 240V, single-phase power. Power cables with pigtail - ends or mating cable stubs can be connected to commercial power when available. Figure C-2 shows a power cable stub connected to a commercial power service box to obtain 240V, single-phase power (hot bus bar to hot bus bar) and/or 120V, single-phase power (hot bus bar to neutral bus bar).

NOTE

Additional guidance for station power distribution arrangement is contained in TM 11-5895-1012-10, Operator's Manual TECHNICAL CONTROL FACILITY (GENERAL), paragraphs 2-23 through 2-28.

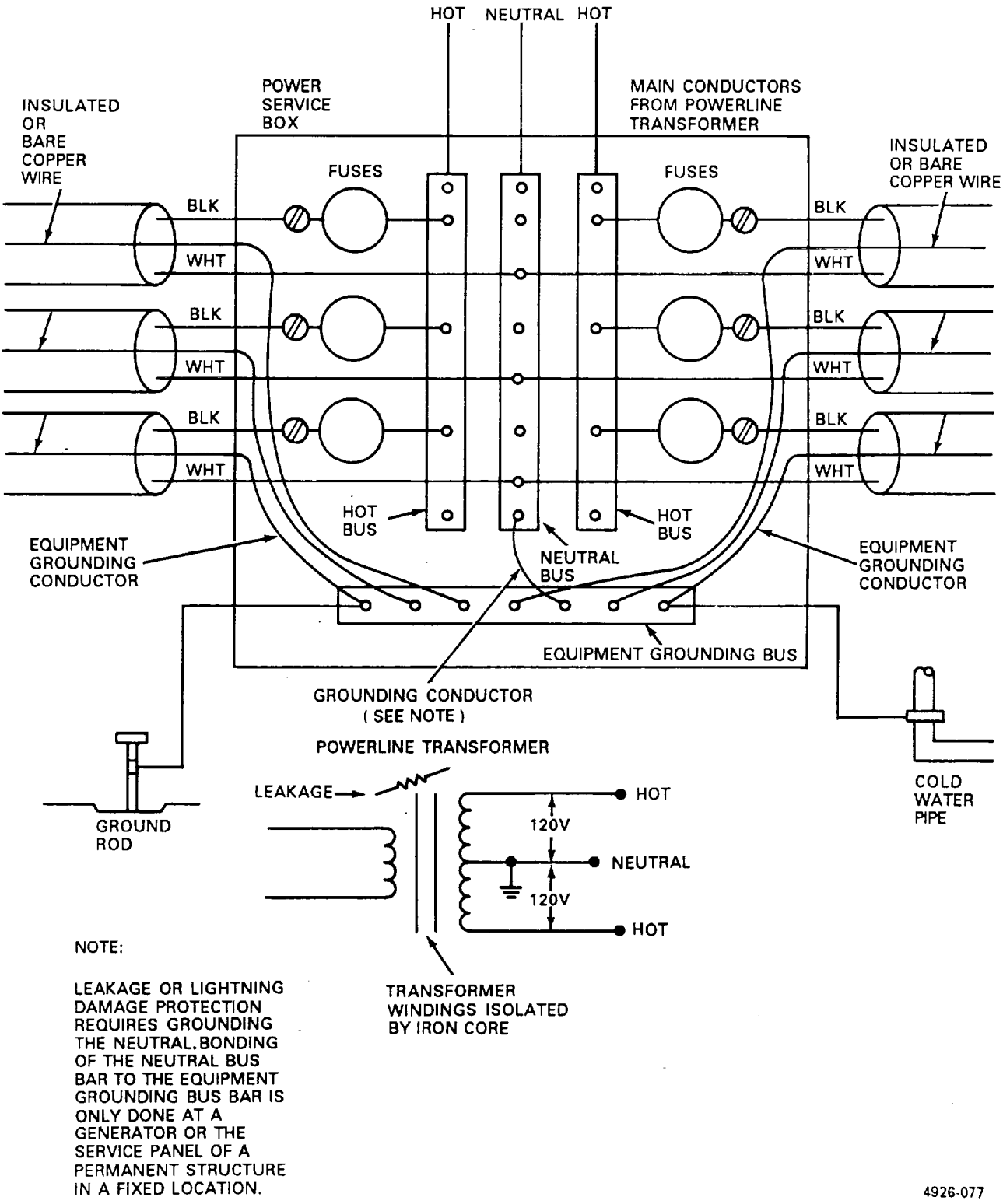


Figure C-1. Typical Commercial Power Service Entrance Panel.

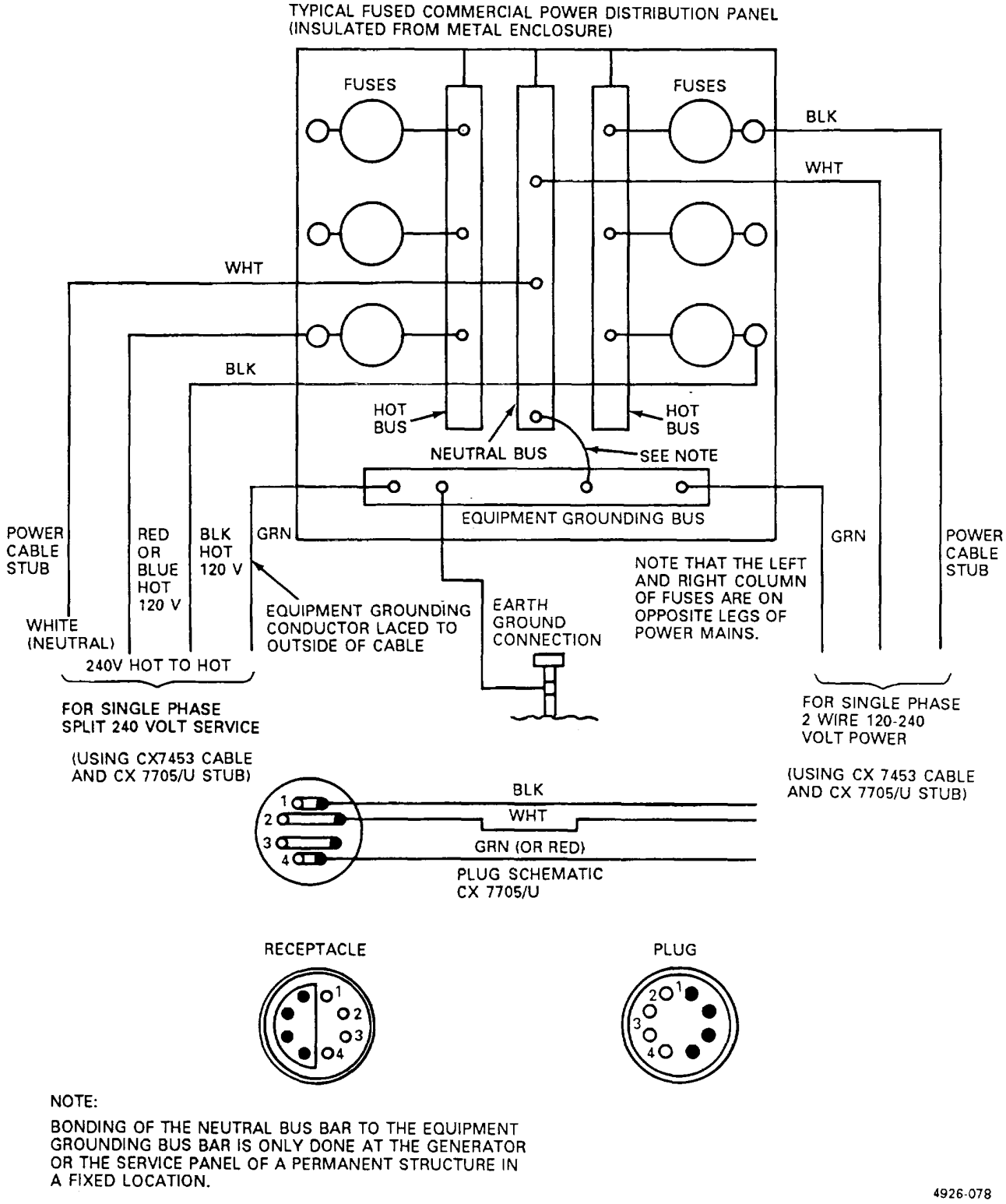


Figure C-2. Connecting Commercial/Power to Equipment Shelters.

Table C- 1. MEP Standard Generator Sets Referenced to Mobile Power Generation Equipment Configurations.

Generator Set Designation	Description				Applicable Technical Manual(s)	Power Unit/Power Plant Configurations			
	KW	Freq	Engine Type	Class					
MEP014A	0.5	60	GED	TU	TM 5-6115329-14				
MEP019A	0.5	400	GED	TU	TM 5-6115-329-14				
MEP024A	0.5	DC	GED	TU	TM 5-6115-329-14				
MEP015A	1.5	60	GED	TU	TM 5-6115-323-14				
MEP025A	1.5	DC	GED	TU	TM 5-6115-323-14				
MEP016A	3.0	60	GED	TU	TM 5-6115-271-14	PU617	PU625'	PU626	PU628'
MEP021A	3.0	400	GED	TU	TM 5-6115-271-14	PU450	PU454	PU564	
MEP026A	3.0	DC	GED	TU	TM 5 6115-271-14	PU666/G			
MEP017A	5.0	60	GED	TU	TM 5-6115-332-14	PU236 PU629	PU409 PU631	PU618-	PU620-
MEP002A	5.0	60	DED	TU	TM 5-6115-584-12, TM 5-6115-584-34	MJQ16			
MEP022A	5.0	400	GED	TU	TM 5-6115-332-14	PU643			
MEP018A	10	60	GED	TU	TM 5-6115-275-14	PU107 PU677	PU332 PU474	PU564 PU659	PU619-
MEP111A	5.0	400	DED	TU					
MEP003A	10	60	DED	WU	TM 5-6115-585-12, TM 5-6115-464-34	MJQ18			
MEP023A	10	400	GED	TU	TM 5-6115-345-12	PU304 PU681	PU375 PU684	PU656	PU678
MEP112A	10	400	DED	TU	TM 5-6115-585-12	MJ025			
MEP004A	15	50-60	DED	TU	TM 5-6115-464-12, TM 5-6115-464-34	MJQ9	PU402	PU405	

NOTE: Abbreviations used in table:

GED	Gasoline Engine Driven Generator
DED	Diesel Engine Driven Generator
GTED	Gas Turbine Engine Driven Generator
TU	Tactical Utility
TP	Tactical Precise
PU	Prime Utility

*Two generator sets and a power transfer switch mounted on a single trailer. (Refer to TM 5-6115-365-15).

Table C-1. MEP Standard Generator Sets Referenced to Mobile Power Generation Equipment Configurations (Continued).

Generator Set Designation	Description				Applicable Technical Manual(s)	Power Unit/Power Plant Configurations			
	KW	Freq	Engine Type	Class					
MEP103A	15	50-60	DED	TP	TM 5-6115-465-12, TM 5-6115-465-34	MJQ9	PU402	PU405	
MEP113A	15	400	DED	TP	TM 5-6115-464-12, TM 5 6115-465-34	MJQ15			
MEPOOSA	30	50-60	DED	TU	TM 5-6115-465-12, TM 5-6115-465-34	PU406 MJQ10	PU407	PU408	PU604
MEP104A	30	50-60	DED	TP	TM 5-6115-465-12, TM 5-6115-545-34				
MP114A	30	400	DED	TP	TM 5-6115-54512, TM 5-6115-545-34				
MEP403A	30	400	GTED	1U	TM 5-6115-545-12, TM 5-6115-545-34				
MEPOO6A	60	50-60	DED	IU	TM 5-6115-545-12, TM 5-6115-545-34	PU650	PU551	MJQ12	
MEP105A	60	5060	DED	TP	TM 5-6115-545-12, TM 5-6115-545-34	MJQ14	PU650	PU699	PU700
MEPl15	60	400	DED	TP	TM 5-6115-293-12, TM 5-6115-293-35	PU707			
MEP404A	60	400	GTED	TU	TM 5-6115-293-12, TM 5-6115-293-35				
MEP007A	100	50-60	DED	TU	TM 5-6115-457-12	PU495			
MEP106A	100	50-60	DED	TP	TM 5-6115-458-12, TM 5-6115-458-34	PU495			

NOTE: Abbreviations used in table:

GED	Gasoline Engine Driven Generator
DED	Diesel Engine Driven Generator
GTED	Gas Turbine Engine Driven Generator
TU	Tactical Utility
TP	Tactical Precise
PU	Prime Utility

Table C- 1. MEP Standard Generator Sets Referenced to Mobile Power Generation Equipment Configurations (Continued).

Generator Set Designation	Description				Applicable Technical Manual(s)	Power Unit/Power Plant Configurations
	KW	Freq	Engine Type	Class		
MEP11GA	100	400	DED	TP	TM 5-6115-458-12 TM 5-6115-458-34	
MEP009A	200	50-60	DED	TU		
MEP108A	200	50-60	DED	TP		
MEP011A	500	50-60	DED	TU		
MEP409A	750	50-60	GTED	PU		
MEP208A	750	50-60	DED	PU		
MEP414A	10	DC	GTED	TU		

NOTE: Abbreviations used in table:

GED	Gasoline Engine Driven Generator
DED	Diesel Engine Driven Generator
GTED	Gas Turbine Engine Driven Generator
TU	Tactical Utility
TP	Tactical Precise
PU	Prime Utility

GLOSSARY

Bonding: The permanent joining of metallic parts to form an electrically conductive path which will insure electrical continuity and the capacity to conduct safely any current likely to be imposed.

Dead Short: A short circuit with minimum resistance to current flow.

Disconnecting Means; A device, or group of devices, or other means by which the conductors of a circuit can be disconnected from their source of supply.

Equipment Grounding Conductor (EGC): A conductor that connects the equipment bonding system of the shelter/equipment to the equipment bonding system of the power generation equipment. During normal operation there is no current flow on the EGC. The EGC may be bare or insulated. The EGC is color-coded green or green with yellow stripes.

Ground: An electrical connection, either accidental or intentional, that exists between an electrical circuit or equipment and earth, or some other electrical circuit or equipment and earth, or some other electrical conducting body which serves in place of the earth.

Ground Conductor: A conductor used to connect a wiring system to a grounding electrode or electrodes.

Grounded Conductor: A system or circuit conductor that is intentionally grounded.

Ground Fault Circuit Interruptor (GFCI): A device that detects current leakage and prevents or minimizes resulting shock hazard by interrupting flow of current (sometimes called current limiter). *National Electrical Code (NEC):* A document providing guidelines and specifications for electrical wiring. The NEC is used as a standard by federal, state, and local authorities when establishing and updating their own ordinances and regulations.

Neutral Conductor: A conductor used to carry the unbalanced current in a polyphase system. In single phase systems, this conductor is used as the normal power return wire. In all hookups in this TB, this conductor is bonded to the grounding electrode at the power generation equipment. The color of this conductor shall be white or natural gray.

Potential: The electrical voltage difference between two bodies which could cause a current to be set up between them should they come into contact with each other.

Ungrounded Conductor: System or circuit conductors that are not grounded. These conductors supply energy to the system. Sometimes referred to as the "hot" conductors, the colors of these conductors are any colors other than gray, white, or green.

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