

Control

GENERAL

The control system includes all functions that relate to starting, monitoring for fault conditions, instrumentation, battery charging, and stopping. This section covers how the control operates, where the components are located, and basic troubleshooting procedures. Two control systems are used with B and N series generator sets. Each system is covered separately in this section.

OPERATION DESCRIPTION FOR BF AND NH (SPEC J) CONTROLS

This operation description applies to BF and NH (Spec J) series generator sets. The wiring diagrams are included as examples to help trace or isolate problems. However, always refer to the specific wiring diagram that corresponds to the model and spec number of the generator set when troubleshooting.

Starting

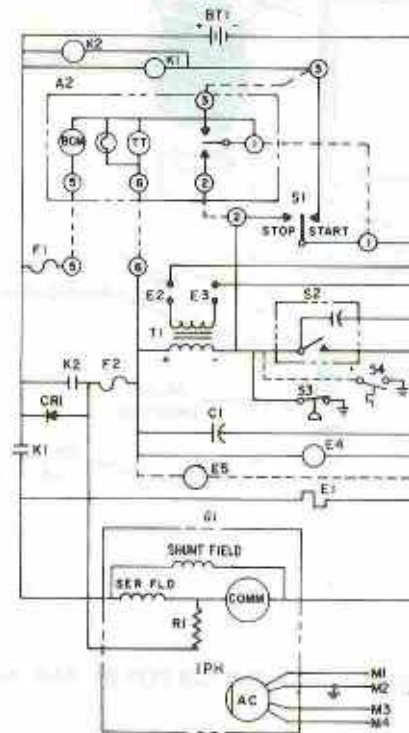
When switch S1 is closed to START (Figure 34), battery ground is connected through switch S1 to the start solenoid K1 and the crank ignition relay K2. Start solenoid relay K1 closes its normally open K1 contacts to connect battery positive to the cranking windings of the generator and to the electric choke E1. The generator acts as a motor and cranks the engine. Ignition relay K2 closes its normally open K2 contacts to connect battery positive to the ignition coil T1, and fuel pump E4. This provides the ignition spark and pumps fuel to the carburetor.

Start Disconnect-Run

When the engine starts, the generator begins to supply voltage to the ignition coil, fuel pump, and fuel solenoid through fuse F2. Releasing the start-stop switch de-energizes the K1 start solenoid and the K2 ignition relay and opens the K1 and K2 contacts. The engine continues to run because the generator is now supplying voltage to operate the ignition coil, fuel pump, and fuel solenoid. Generator voltage is also supplied through CR1 to charge the battery and to the electric choke heater E1 to open the choke.

Stopping

Moving switch S1 to STOP position connects battery ground to terminal 2. This grounds the ignition coil to stop the spark at the plugs. When the engine stops, blocking diode CR1 prevents battery discharge through the generator.



- A2 Deluxe Remote Control
- BT1 Battery
- E1 Electric Choke
- E2,E3 Spark Plugs
- E4 Fuel Pump
- E5 Fuel Solenoid
- G1 Generator
- K1 Start Solenoid
- K2 Crank Ignition Relay
- S1 Start-Stop Switch
- S2 Breaker Points Assembly
- S3 Low Oil Pressure Switch
- S4 High Air Temperature Switch (Optional)
- T1 Ignition Coil

FIGURE 34. TYPICAL SCHEMATIC AND PARTS IDENTIFICATION

TROUBLESHOOTING THE BF AND NH (SPEC J) CONTROL (HMC)

To correct a problem, answer the question in the appropriate troubleshooting chart either "YES" or "NO." Refer to the number in that column and proceed to that step.

Use the wiring diagrams (see Figures 36 and 37) for location of terminals, relays, etc. Figure 35 shows some of the control components for these generator sets.

The troubleshooting chart is divided into seven sections. Determine the problem and then refer to the chart (A, B, C, D, E, F, or G) for the troubleshooting procedures.

- A. Engine does not crank.
- B. Engine cranks but does not start.
- C. Engine starts but stops when start switch is released.
- D. Engine is running - then stops.
- E. Low battery - no charge rate.
- F. Running time meter inoperative.
- G. Battery condition meter inoperative.

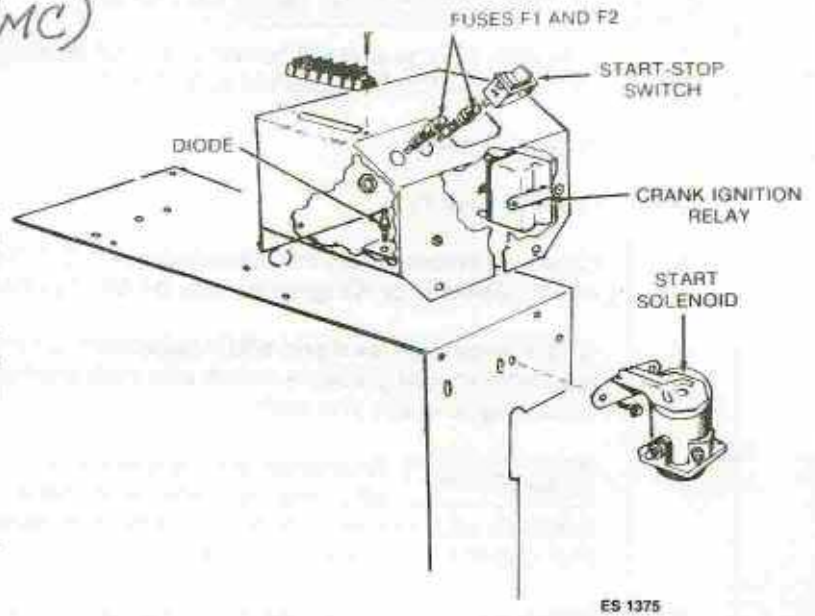


FIGURE 35. BF AND NH (SPEC J) CONTROL

A.	ENGINE DOES NOT CRANK	YES	NO
1.	Does engine crank at set but not at remote start panel?	2	4
2.	Check remote start control wires for continuity between the generator set and the remote start panel. Are control wires sized large enough to avoid excessive voltage drop?	4	3
3.	Replace control wires with correct wire gauge.	—	—
4.	Check condition of battery and terminal connections. Is battery fully-charged and are all terminal connections clean and tight?	6	5
5.	Recharge battery and clean and tighten all terminal connections.	—	—
6.	Is battery voltage present between control terminals 3 and 5 when switch S1 is pushed to START? When the remote start switch is pushed to START? (Make certain fuse F1 is not open.)	8	7
7.	Replace start-stop switch S1 or remote start switch as required.	—	—
8.	Is battery voltage present between K1 start solenoid terminal S1 and ground when start-stop switch S1 is pushed to START?	10	9
9.	Replace K1 start solenoid.	—	—
10.	Check generator brushes, commutator, DC armature windings, and field windings. See Generator Service Procedures section.	—	—

B.	ENGINE CRANKS BUT DOES NOT START	YES	NO
1.	Is battery voltage present between control terminal 6 and ground when start-stop switch S1 is pushed to START?	5	2
2.	Is fuse F2 open?	3	4
3.	Replace fuse F2.	—	—
4.	Check all solenoid terminal connections. If OK, replace K1 start solenoid on BF (Spec A) or K2 ignition relay on BF (Spec B) and NH (Spec J).	—	—
5.	Check engine oil level and add if necessary. If oil level is OK, remove wire lead from low oil pressure switch and push start-stop switch S1 to START. Does engine crank and run?	7	6
	CAUTION <i>To prevent engine damage from low oil pressure, make sure the engine builds up oil pressure to 30 psi (207 kPa) after starting. See Lubrication System section.</i>		
6.	Check low oil pressure lead wire for grounding and repair or replace as necessary. Will engine start?	—	8
7.	Check low oil pressure switch operation. Switch should open when oil pressure builds up and close when oil pressure drops. Replace if necessary.	—	—
8.	Does engine have high air temperature switch?	9	12
9.	Remove wire lead from high air temperature switch and push start-stop switch S1 to START (do not let lead ground while disconnected). Does engine crank and run?	11	10
10.	Check high air temperature lead wire for grounding and repair or replace as necessary. Will engine start?	—	12
11.	Check high air temperature switch operation. Switch should be open unless engine overheats. Replace if necessary.	—	—
12.	Does the fuel pump operate and does the fuel solenoid open during cranking?	15	13
13.	Check the fuel pump lead wire connections and repair or replace as necessary. Will pump operate?	—	14
14.	Refer to the Fuel System section for testing and service procedures.	—	—
15.	Is the choke closed? A small pointer on the choke shaft indicates if the choke is open or closed.	16	14
16.	Refer to the Ignition System section for testing and service procedures.	—	—

C.	ENGINE STARTS BUT STOPS WHEN START SWITCH IS RELEASED	YES	NO
1.	Connect voltmeter between control terminal 6 and ground and crank engine. Is there a DC voltage output from the generator? (Fuse F2 should be OK if unit started initially.)	—	2
2.	Check R1 resistor and connections. If OK, check brushes, commutator, armature windings, and field windings. Refer to Generator Service Procedures section.	—	—
D.	ENGINE IS RUNNING - THEN STOPS	YES	NO
1.	Check for low fuel level or low oil level. Refill with fuel or oil as required. Will set start and run without stopping?	—	2
2.	Check for low oil pressure, low oil pressure switch malfunction, overheating, or high air temperature switch malfunction. See sections B5 through B11 for the troubleshooting procedures. Does this locate the problem?	—	3
3.	Connect a voltmeter between control terminal 6 and ground. Push the start-stop switch S1 to START. Is battery voltage present?	6	4
4.	Is fuse F2 open?	5	6
5.	Replace fuse F2.	—	—
6.	Check for an open R1 resistor or for open connections between R1 and fuse F2. If OK, check generator brushes, commutator, DC armature windings, and field windings. See Generator Service Procedures section.	—	—
E.	LOW BATTERY	YES	NO
1.	Does battery charger show a normal charge rate of 1 to 1-1/2 amps?	2	3
2.	Check condition of battery. Generator set charger will not recharge a battery that is in a very low state of charge. Use a separate battery charger to bring battery up to full charge.	—	—
3.	Check wire connections between CR1 diode, K1 start solenoid, and battery. Does this cause battery charger to show normal charge?	—	4
4.	Is CR1 diode shorted or open?	5	6
5.	Replace defective CR1 diode.	—	—
6.	Replace R1 resistor.	—	—
F.	RUNNING TIME METER INOPERATIVE	YES	NO
1.	Check wires between control terminal 6 and battery positive terminal for running time meter, and ground wire and connection to meter. Does this correct problem?	—	2
2.	Replace defective running time meter.	—	—

G.	BATTERY CONDITION METER INOPERATIVE	YES	NO
1.	Is fuse F1 open?	2	3
2.	Replace fuse F1.	—	—
3.	Check wire connections between control terminal 5 and battery condition meter and between battery condition meter and ground. Does this correct problem?	—	4
4.	Use voltmeter to measure voltage between battery charge meter positive terminal and ground. Does voltmeter read battery voltage minus 10 volts?	6	5
5.	Replace defective zener diode.	—	—
6.	Replace defective battery condition meter.	—	—