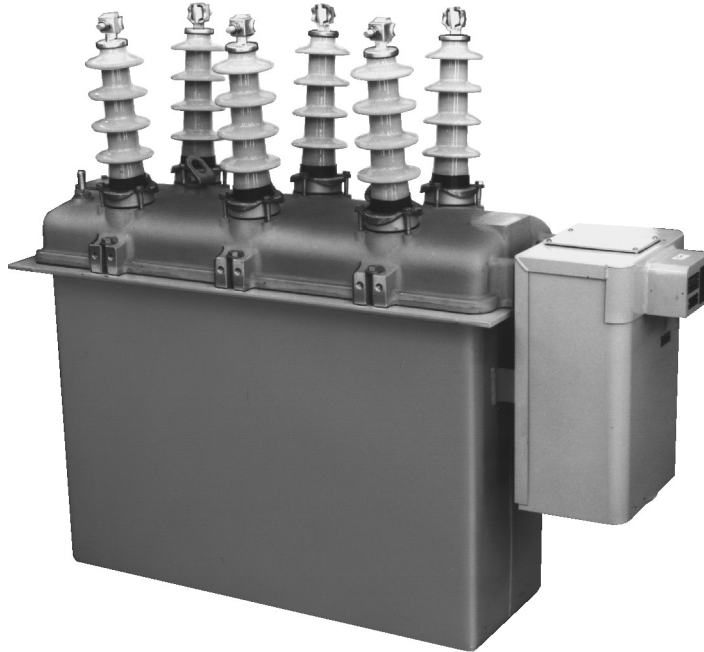


Sectionalizers

Type GV and GW Installation Instructions

Service Information
S270-20-3

Applicable to serial numbers above 2265 for Type GV and 4803 for Type GW



84574KMA

Figure 1.
Kyle® Type GW Sectionalizer.

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SAFETY FOR LIFE



Cooper Power Systems products meet or exceed all applicable industry standards relating to product safety. We actively promote safe practices in the use and maintenance of our products through our service literature, instructional training programs, and the continuous efforts of all Cooper Power Systems employees involved in product design, manufacture, marketing, and service.

We strongly urge that you always follow all locally approved safety procedures and safety instructions when working around high voltage lines and equipment and support our “Safety For Life” mission.

SAFETY INFORMATION

The instructions in this manual are not intended as a substitute for proper training or adequate experience in the safe operation of the equipment described. Only competent technicians, who are familiar with this equipment should install, operate, and service it.


A competent technician has these qualifications:

- *Is thoroughly familiar with these instructions.*
- *Is trained in industry-accepted high- and low-voltage safe operating practices and procedures.*
- *Is trained and authorized to energize, de-energize, clear, and ground power distribution equipment.*
- *Is trained in the care and use of protective equipment such as flash clothing, safety glasses, face shield, hard hat, rubber gloves, hotstick, etc.*


Following is important safety information. For safe installation and operation of this equipment, be sure to read and understand all cautions and warnings.

Safety Instructions


Following are general caution and warning statements that apply to this equipment. Additional statements, related to specific tasks and procedures, are located throughout the manual.

 **DANGER:** Hazardous voltage. Contact with hazardous voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high- and low- voltage lines and equipment.


G103.3

 **WARNING:** Before installing, operating, maintaining, or testing this equipment, carefully read and understand the contents of this manual. Improper operation, handling or maintenance can result in death, severe personal injury, and equipment damage.

G101.0

 **WARNING:** This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply may result in death, severe personal injury and equipment damage.


G102.1


 **WARNING:** Power distribution equipment must be properly selected for the intended application. It must be installed and serviced by competent personnel who have been trained and understand proper safety procedures. These instructions are written for such personnel and are not a substitute for adequate training and experience in safety procedures. Failure to properly select, install, or maintain power distribution equipment can result in death, severe personal injury, and equipment damage.


G122.2

Hazard Statement Definitions

This manual may contain four types of hazard statements:

 **DANGER:** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

 **WARNING:** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

 **CAUTION:** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in equipment damage only.



PRODUCT INFORMATION

Introduction

Service Information S270-20-3 provides installation and operation instructions for the Kyle Type GV and GW Sectionalizers. Before installing and operating this sectionalizer, carefully read and understand the contents of this manual.

Read this Manual First

Read and understand the contents of this manual and follow all locally approved procedures and safety practices before installing or operating this equipment.

Additional Information

These instructions can not cover all details or variations in the equipment, procedures, or processes described nor provide directions for meeting every possible contingency during installation, operation, or maintenance. For additional information, please contact your Cooper Power Systems representative.

Acceptance and Initial Inspection

Each sectionalizer is completely assembled, tested, inspected, adjusted, and filled to the correct level with insulating oil at the factory. It is in good condition when accepted by the carrier for shipment.

Upon receipt, inspect the shipping container for signs of damage. Unpack the sectionalizer and inspect it thoroughly for damage incurred during shipment. If damage is discovered, file a claim with the carrier immediately.

Check for oil leakage, and tighten all bolts that may have been loosened during shipment, especially the bolts attaching the head to the tank.

Handling and Storage

Be careful during handling and storage of the sectionalizer to minimize the possibility of damage. If the sectionalizer is to be stored for any length of time prior to installation, provide a clean, dry storage area. Locate the sectionalizer so as to minimize the possibility of mechanical damage. In particular, protect the bushings and keep the operator cabinet closed to protect the electronic control components.

Standards

Kyle sectionalizers are designed and tested in accordance with ANSI standard C37.63 where applicable.

Quality Standards

ISO 9001:2000 Certified Quality Management System

Description

The sectionalizer is a self-contained, circuit-opening device used in conjunction with source-side protective devices such as reclosers or circuit breakers, to automatically isolate faulted sections of electrical distribution systems. The sectionalizer senses current flow above a preset level, and, when the source-side protective device opens to de-energize the circuit, the sectionalizer counts the overcurrent interruption. Depending upon the coordination scheme, the sectionalizer will open during the first, second, and third open interval of the fault interrupting device to isolate permanent faults and confine outages to smaller sections of line.

The sectionalizer does not interrupt fault current but can be closed into a faulted line. It opens during the open interval of the backup device. For this reason, it must always be used in series with a fault-interrupting backup protective reclosing device. Also, it will reset counts that do not reach the counts-to-open setting within the selected reset time due to clearing of temporary faults.

A minimum of 0.5 A of load current flowing through the sectionalizer will block the generation of a count pulse. This count-restraint feature prevents the sectionalizer from counting overcurrents interrupted by down-line devices.

The sectionalizers are also equipped with an inrush-current restraint feature which distinguishes between inrush currents and fault currents. If it is determined that the overcurrent through the sectionalizer is inrush current, the phase and ground current levels of the sectionalizer are blocked for a duration of 3 seconds upon current detection.

RATINGS

Tables 1 and 2 show rating information for the Types GV and GW sectionalizers.

Table 1
Basic Sectionalizer Ratings

	Type GV	Type GW
Nominal Voltage (kV)	14.4	34.5
Rated Maximum Voltage (kV)	15.5	38.0
Impulse Withstand 1.2 x 5.0 microsecond wave BIL (kV)	110	150
60 Hz withstand Dry, 1 minute (kV)	50	70
Wet, 10 seconds (kV)	45	60
Continuous Current Rating (A)	400	400
Rated symmetrical interrupting current (A rms)	880	880
Rated making current, asymmetrical (A rms)	20000	15000
Short-time ratings (A rms) 10-seconds symmetrical	4000	3500
1-second symmetrical	12500	10000
Momentary maximum, asymmetrical (A rms)	20000	15000
Creepage distance, standard bushing mm (in)	280 (11)	431 (17)

Table 2
Operating Data

Phase-minimum- actuating current (A)	16, 24, 40, 56, 80, 112, 160, 224, 256, 296, 320, 448, 480, 640
Ground-minimum- actuating current (A)	3.5, 7, 16, 20, 28, 40, 56, 80, 112, 160, 224, 320, 448, BLOCK
Number of counts to open	1, 2, 3
Count reset (seconds)	15, 30, 60, 90, 120, 180

DIMENSIONS AND WEIGHT

Figures 2 and 3 show essential dimensional information for Types GV and GW sectionalizers, along with their weights and oil capacities.

Note: All dimensions are approximate and are given in mm (inches).

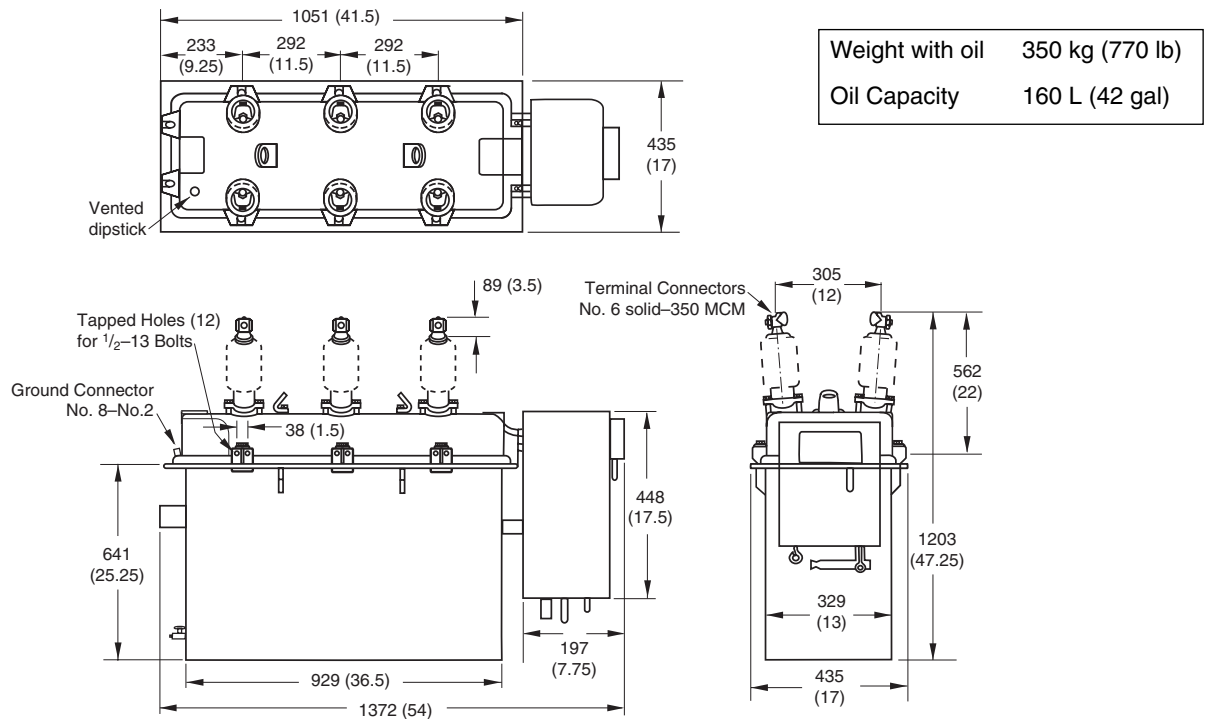


Figure 2.
Type GW Sectionalizer.

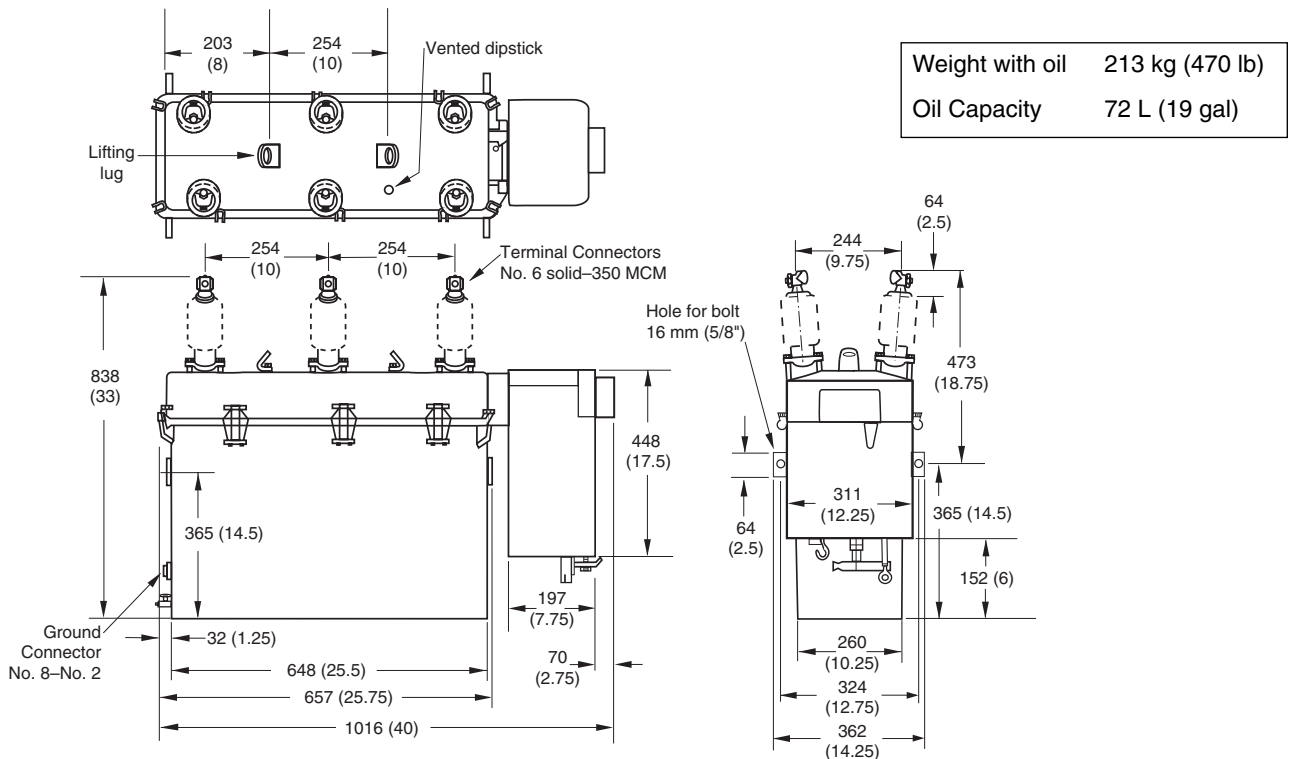


Figure 3.
Type GV Sectionalizer.

OPERATING CONTROLS AND SETTINGS

WARNING: Do not rely on the open position of the yellow operating handle; it does not ensure that the line has been de-energized. Always establish a visible disconnect. Failure to follow proper safety practices can result in contact with high voltage, which will cause death or severe personal injury. G116.0

WARNING: Always use a hotstick when working with this equipment. Failure to do so could result in contact with high voltage, which will cause death or severe personal injury. G108.1

Manual Operating Controls

The operating controls for the sectionalizer are located on the underside of the operator mechanism housing, as shown in Figure 4.

Manual Opening

The hookstick-operated, manual opening pullring trips open the sectionalizer with one pull of the yellow pullring.

One-Count-To-Open Lever

The one-count-to-open lever provides the capability of opening the sectionalizer on the first overcurrent interruption count. It provides for added safety during downline hot-line work without disturbing the normal counts-to-open setting of the sectionalizer. The hookstick-operated lever locks into position when pulled down, and must be manually reset to restore normal counts-to-lockout.

Manual Closing

The hookstick-operated, manual closing pullring closes the sectionalizer when the gray pullring is pulled down approximately 10 to 12 times. The pullring manually charges the closing springs and overtoggles the springs to initiate the closing. (When the sectionalizer closes, the resistance on the pullring is eliminated.) This is the only means of closing the sectionalizer.

IMPORTANT: The potential charging board also includes a voltage restraint feature which prevents the unit from counting overcurrent interruptions unless the auxiliary voltage is also interrupted. Therefore, the auxiliary power must be obtained from the load side of the backup protective device so that the board is energized only when the backup is closed. Failure to follow this precaution will prevent proper operation of the sectionalizer.

Auxiliary Power

Auxiliary power (120 Vac, 25 VA, min.) is required for the cabinet heater and/or potential charging of the trip capacitor. The input receptacle is located on the underside of the operator cabinet (Figure 4). A mating connector plug is also provided with the unit.

Indicating Devices

A contact position indicator and an operations counter are located under the sleet hood of the operator cabinet.

The yellow contact position indicator is pinned to the main operating shaft of the sectionalizer to indicate the OPEN and CLOSED condition of the main contacts.

The operations counter gives a visual indication of the cumulative number of openings of the unit.

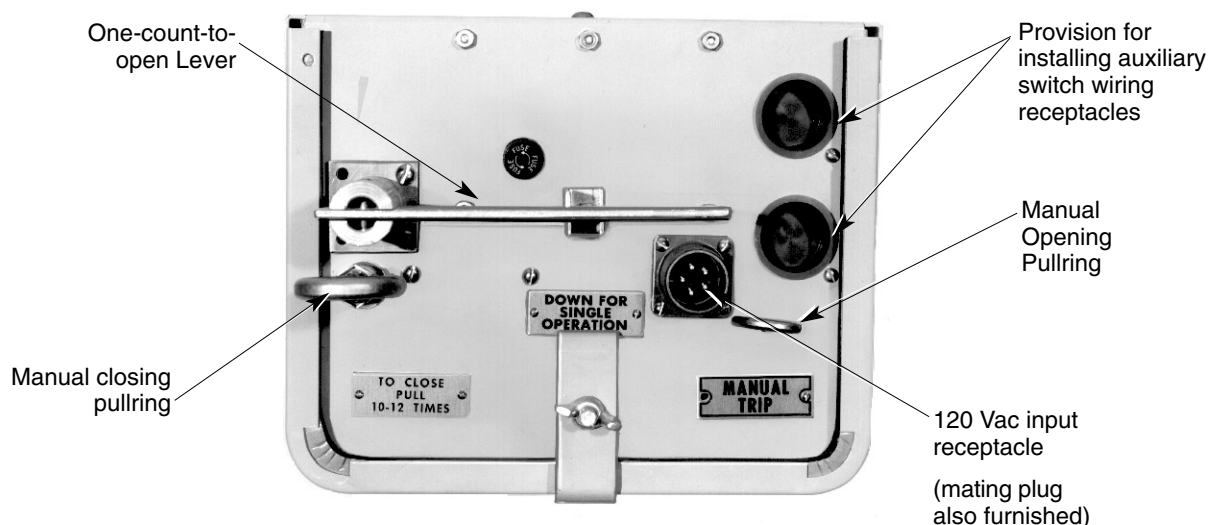


Figure 4. Operating controls on the underside of the operator cabinet.

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Settings

CAUTION: Equipment Damage. The sectionalizer must be bypassed and disconnected prior to changing minimum actuating resistor settings. Failure to comply will cause circuit board damage and may cause misoperation (unintentional operation) of the sectionalizer. T277.0

The operating characteristics are preset to customer specifications and tested prior to shipment from the factory. However, if the sectionalizer is relocated or the coordination scheme is modified, the operating characteristics can be changed by the user. The settings should be checked before the unit is put into service. All settings are located on the printed circuit board in the operator mechanism cabinet and are accessible when the cabinet cover is removed. See Figure 6. To access the settings on an in-service sectionalizer, follow this procedure to remove the sectionalizer from service.

1. Close all three bypass switches (see Figure 5).
2. Pull down the yellow operating handle with a hot-stick. The yellow operating handle is located under the sleet hood (see Figures 3 and 4).
3. Open the source and load disconnect switches (see Figure 5).
4. Remove the cabinet cover.

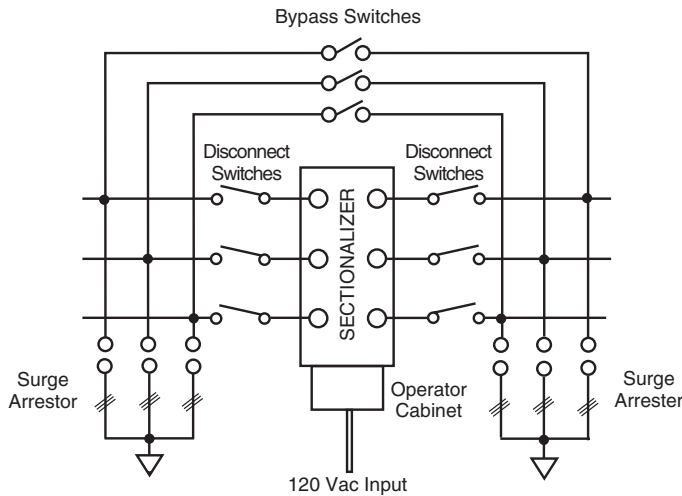


Figure 5.
Main Wiring Connections.

Minimum Actuating Current

The minimum actuating current levels for both phase and ground are determined by the selection of the proper plug-in resistors. (Normally, these settings are approximately 80% of the minimum trip settings of the backup protective device.)

NOTE: If the backup device is not equipped for ground fault sensing and tripping, the ground current sensing circuits of the sectionalizer can be deactivated by using a shorting resistor labeled BLOCK.

Phase current resistors are identified with the phase symbol (\emptyset) and the actuating current value in amperes. Catalog numbers for the available phase current resistors are listed in Table 3.

Ground current resistors are identified with the ground symbol (\perp) and the actuating current value in amperes. Catalog numbers for the available ground current resistors are listed in Table 4.

The minimum actuating current of the sectionalizer for both phase and ground can be changed by merely changing the appropriate plug-in resistor.

TABLE 3
Minimum Actuating Resistor (Phase)

Label Value (A)	Resistance (Ω)		Catalog Number
	Minimum	Maximum	
16	264	270	KA176GV16
24	172	176	KA176GV24
40	94.3	96.3	KA176GV40
56	66.3	67.7	KA176GV56
80	47	48	KA176GV80
112	32.6	33.4	KA176GV112
60	22.9	23.5	KA176GV160
224	16.3	16.7	KA176GV224
256	13.8	14.2	KA176GV256
296	11.9	12.3	KA176GV296
320	11.1	11.5	KA176GV320
448	8.1	8.3	KA176GV448
480	7.4	7.6	KA176GV480
640	5.5	5.7	KA176GV640

Table 4
Minimum Actuating Resistor (Ground)

Label Value (A)	Resistance (Ω)		Catalog Number
	Minimum	Maximum	
3.5	6.91 k	7.05 k	KA177GV3.5
7	1.168 k	1.192 k	KA177GV7
16	379.0	387.0	KA177GV16
20	298.0	304.0	KA177GV20
28	200.0	204.0	KA177GV28
40	135.6	138.4	KA177GV40
56	94.3	96.3	KA177GV56
80	66.3	67.7	KA177GV80
112	47.0	48.0	KA177GV112
160	32.6	33.4	KA177GV160
224	22.9	23.5	KA177GV224
320	15.8	16.2	KA177GV320
448	11.2	11.4	KA177GV448
BLOCK	0	0.1	KA177GVBLO

Counts-to-Open

The counts-to-open setting is determined by the position of the COUNTS-TO-OPEN selector switch. Switch positions 1, 2, and 3 correspond to 1, 2, or 3 counts to open. Normally, this setting is one less than the number of operations to lockout of the backup protective device. To change the number of counts-to-open setting, merely change the position of the rotary switch.

Count Reset

The reset setting is determined by the position of the COUNT RESET switch. Reset times of 15, 30, 60, 90, 120, and 180 seconds are available. This feature resets to zero any accumulated counts whenever current through the sectionalizer flows without interruption for longer than the time programmed.

The reset feature will operate with any current flow from minimum load (0.5 A) to values below phase or ground pickup levels.

Inrush-Current Restraint

The inrush-current restraint feature blocks the phase and ground actuating levels for three seconds after current flow through the sectionalizer is restored and the overcurrent has been determined to be inrush current.

The three second time interval allows for system inrush parameters to stabilize prior to allowing the sensitivity of the sectionalizer to return to its programmed state.

Response Time

For backfed motor contribution and unsymmetrical clearing of upline faults, a response time is built into the sectionalizer control to eliminate unwanted counting of these situations. Upon detection of any current above the phase or ground actuating setting, the current must exceed the response-time characteristics as illustrated in Figure 7. Total clearing time of reclosers and breakers must exceed the response-time characteristic of the sectionalizer.

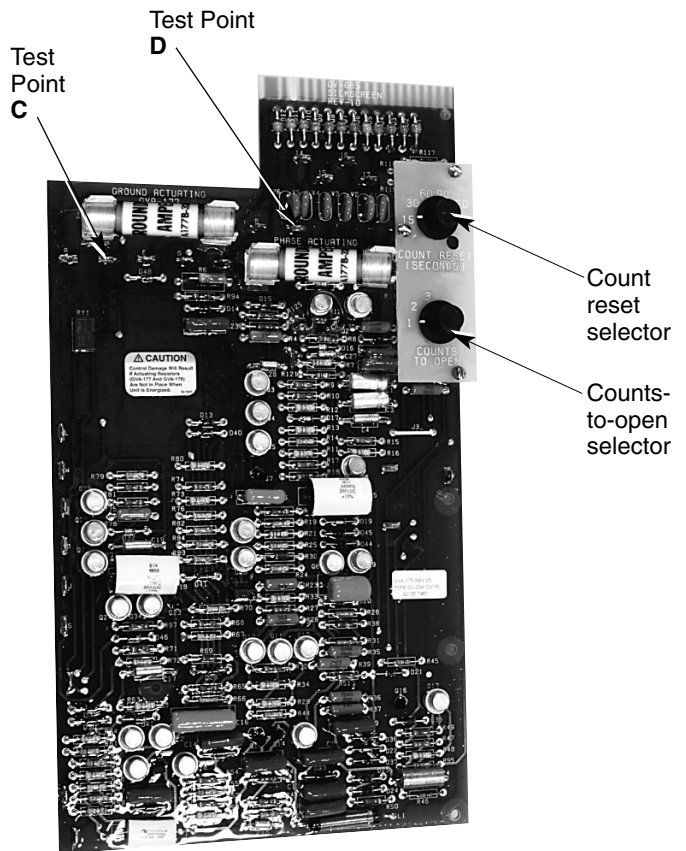


Figure 6. Operating characteristics of the sectionalizer are programmed on the printed circuit board in the operator cabinet.

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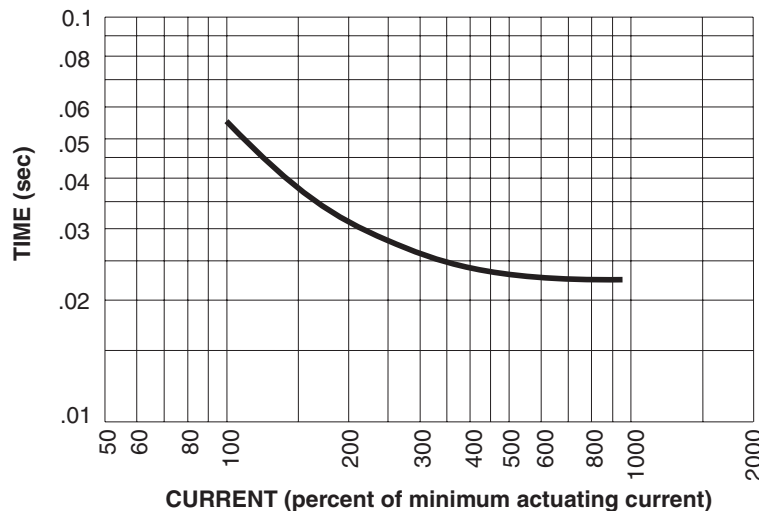


Figure 7. Maximum Response-Time Characteristics.

INSTALLATION

Oil Level and Dielectric Strength

WARNING: Do not operate this equipment out of oil. Oil is the electrical insulating medium within this equipment; operating out of oil will result in internal flashovers that will damage the equipment and can cause death or severe personal injury. G104.2

CAUTION: This equipment relies on oil to provide electrical insulation between components. The dielectric strength of the oil must be checked on a regular basis, as part of the routine maintenance inspection, to ensure that it is at or above minimum dielectric requirements. Use of this equipment with insulating oil that does not meet minimum requirements can result in internal flashovers that will damage the equipment and can cause personal injury. G107.2

Make sure the oil in the tank is at the proper level by checking the vented dipstick in the head casting. Replenish any loss with new, dry transformer oil. Refer to Figures 2 and 3.

If the switch has been stored for any length of time or is being relocated, check the dielectric strength of the oil in accordance with ASTM-approved testing procedures. Physical properties of the oil used in Kyle® distribution switchgear is found in *Reference Data R280-90-1*.

1. In new equipment, the oil must have a minimum dielectric strength of 26 kV. If less than 26 kV, filter the oil to restore its dielectric strength to an acceptable level.
2. If the equipment has been in service and is being relocated, the minimum dielectric strength of the oil must be at least 22 kV. If less than 22 kV, or if the oil is contaminated with carbon or sludge, replace the oil.
3. Check that the actual settings agree with the sectionalizer nameplate and are correct for the planned installation.

Lifting the Sectionalizer

CAUTION: Follow all locally approved safety practices when lifting and mounting the equipment. Use the lifting lugs provided. Lift the unit smoothly and do not allow the unit to shift. Improper lifting can result in equipment damage. G106.2

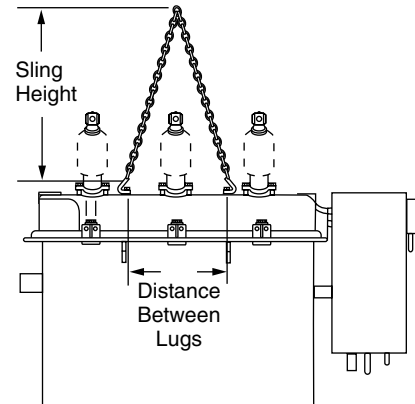


Figure 8.
Lifting the sectionalizer.

Follow all approved safety practices when making hitches and lifting the equipment. Lift the load smoothly, and do not allow the load to shift.

This unit has two lifting lugs. **Both lugs must be used when lifting.** Maximum strength is attained with a vertical lift attached to the lugs. Use a spreader bar with a fixed attachment point for the hook at the load center.

If a sling is used, it must have a fixed attachment point at the load center. Rig the load so that the sling height is equal to or greater than the distance between lifting lugs. See Figure 8.

Mounting the Sectionalizer

Figures 9 and 10 show installation using Kyle mounting frames. If other mounting means are used, support the GV sectionalizer at the four 5/8 inch bolt holes in the mounting rails on the tank. The GW sectionalizer is supported at the twelve 1/2-13 threaded holes tapped into the sides of the head casting.

Grounding the Sectionalizer

WARNING: Hazardous Voltage. Solidly ground all equipment. Failure to comply can result in death, severe personal injury, and equipment damage. T223.2

Make ground connections to the sectionalizer. Refer to Figures 2 and 3.

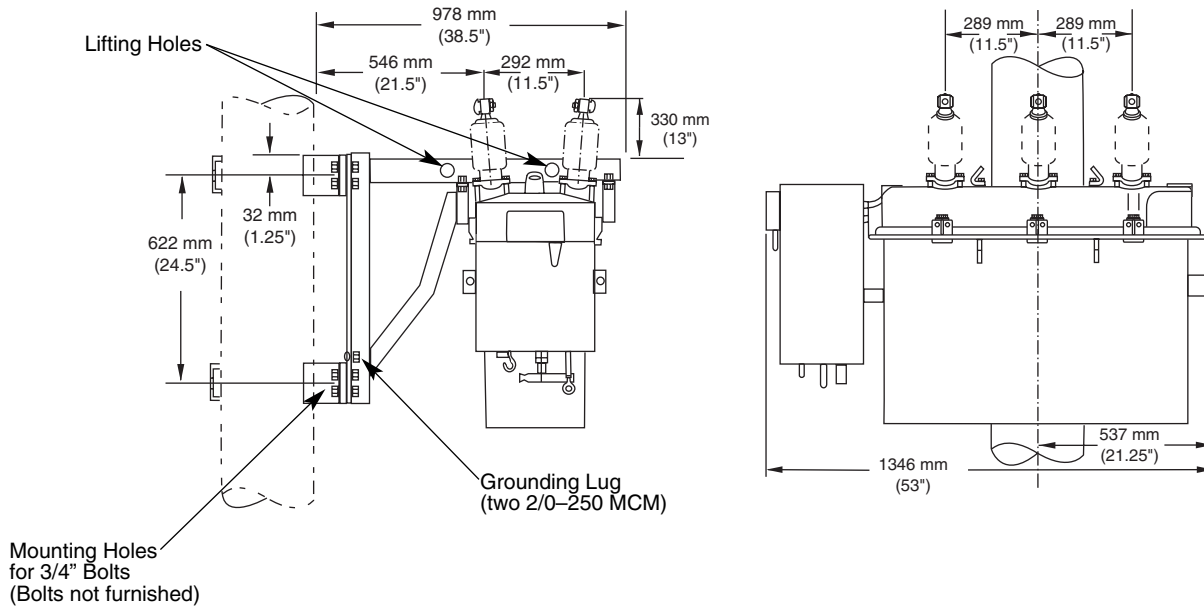


Figure 9.
Type GW sectionalizer in the KA146W3 pole-mounting hanger.

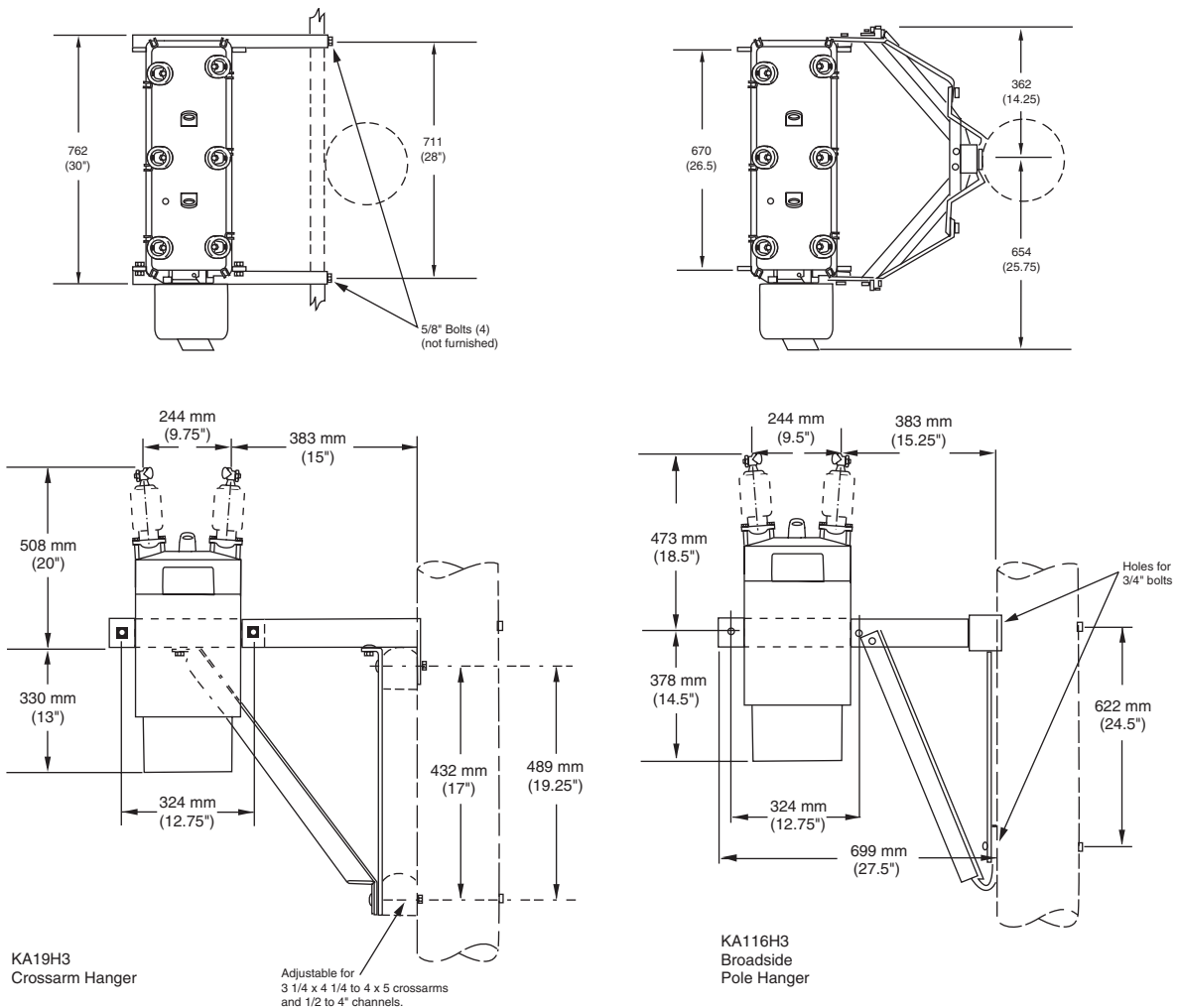


Figure 10.
Mounting hardware for Type GV sectionalizer.

High-Voltage Connections

It is desirable to provide the sectionalizer with switches and protection as shown in Figure 11. Surge protection on both sides of the sectionalizer is recommended. However, if provided on only one side, it should be on the source side. In substations, surge protection should be provided on the load side of the sectionalizer.

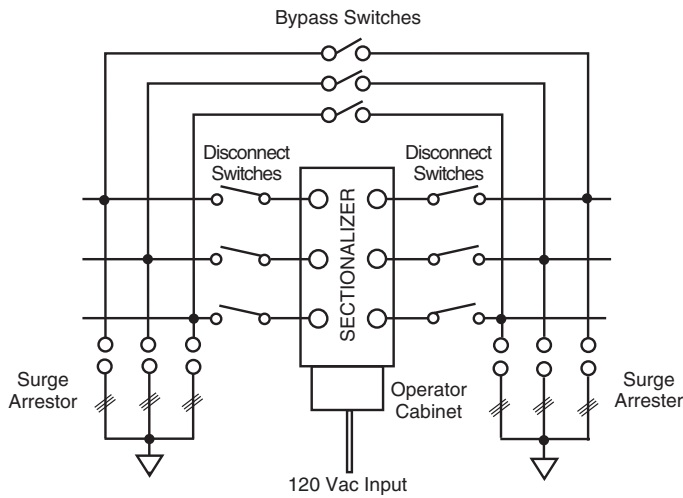


Figure 11.
Main Wiring Connections.

The universal clamp-type terminals used for main line connections accept No. 2 solid through 350 mcm copper or aluminum cables.

The parallel connector grounding clamp on the tank of the Type GV and the cover of the GW sectionalizers will accept No. 8 through No. 2 stranded wire.

120 Vac Wiring

A 120 Vac source voltage is required if the mechanism cabinet heater and the potential charger for the trip capacitor are to be energized.

The line voltage is connected to pins B and D of the source-voltage plug shown in Figure 12.

Internal Wiring

A connection diagram for the GV and GW sectionalizers is shown in Figures 12 and 13.

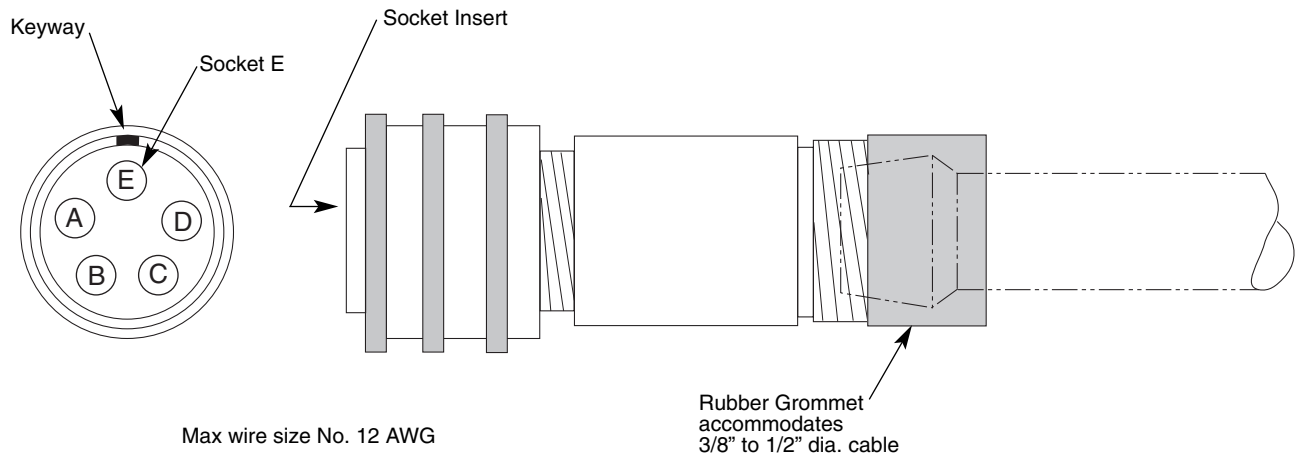


Figure 12.
125 Vac Input Connector Plug.

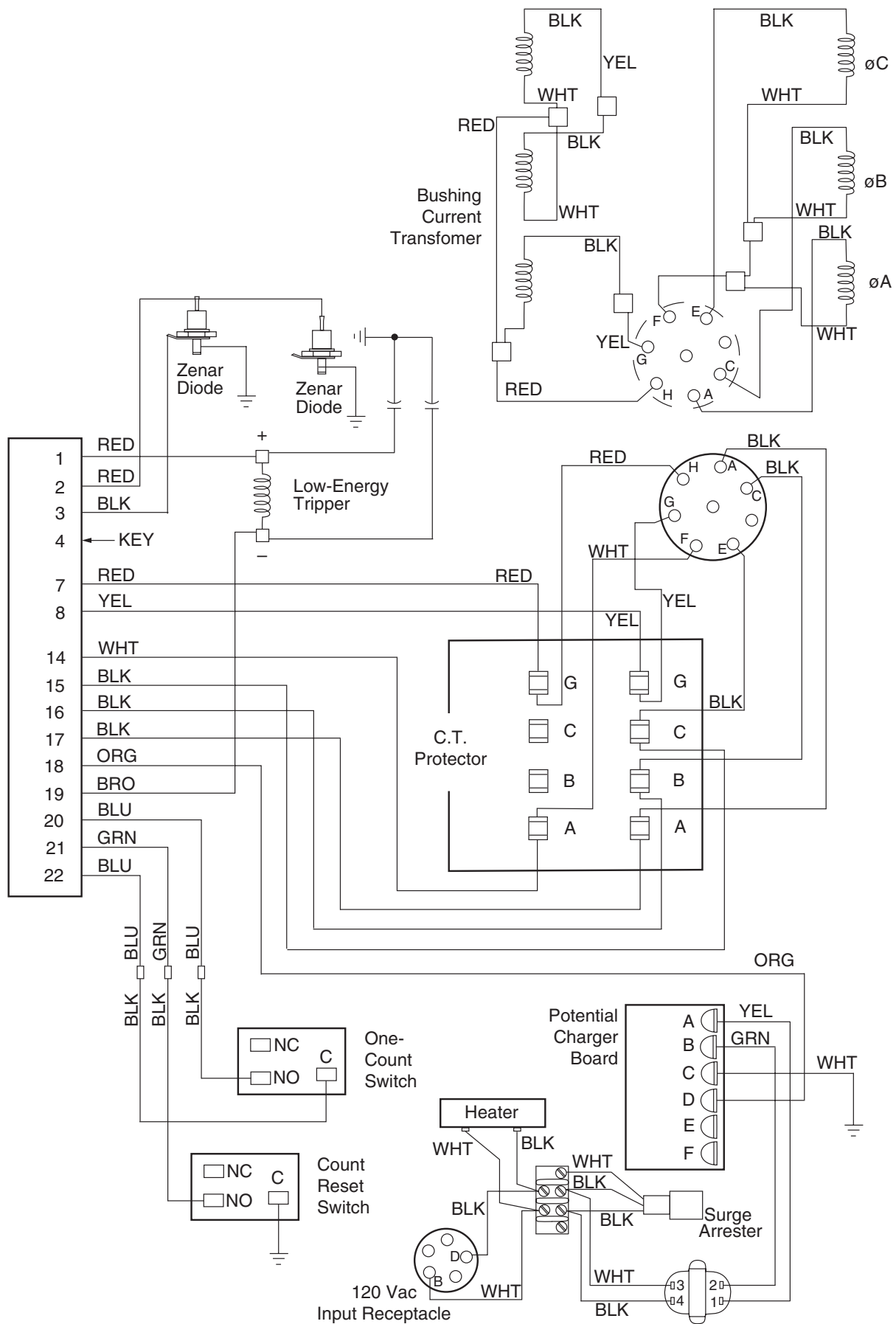


Figure 13.
Internal Connections Diagram.

Auxiliary Switch (KA46GV3)

The auxiliary switch, mounted to the top of the operator cabinet, in a weather-proof housing, is used for relaying or interlocking schemes and remote contact indication.

A three-stage auxiliary switch is provided. Each stage consists of two independent contact assemblies with either “a” (normally open) or “b” (normally closed) contacts which can be easily changed in the field. A data plate attached to the switch cover shows the switch arrangement. Related switch contact positions are shown in Table 5.

Table 5
Related Switch Contact Positions

When Sectionalizer Contacts Are	Closed	Open
Auxiliary “a” contacts are	Closed	Open
Auxiliary “b” contacts are	Open	Closed

The switch is permanently wired to two multipin receptacles in the bottom of the operator cabinet. Table 6 shows the pin arrangement of the the mating plug shown in Figure 14.

The switch contacts are insulated for 600 V and have a continuous current rating of 10 A. Their interrupting ratings are shown in Table 7.

Table 7
Interrupting Ratings - Switch Contacts

Volts	Inductive ac (A)	Non-Inductive ac (A)	Inductive dc (A)	Non-Inductive dc (A)
24 dc	—	—	15	20
48 dc	—	—	7.5	10
120 ac	60	80	—	—
125 dc	—	—	1.5	2
240 ac	30	60	—	—
250 dc	—	—	0.45	0.5

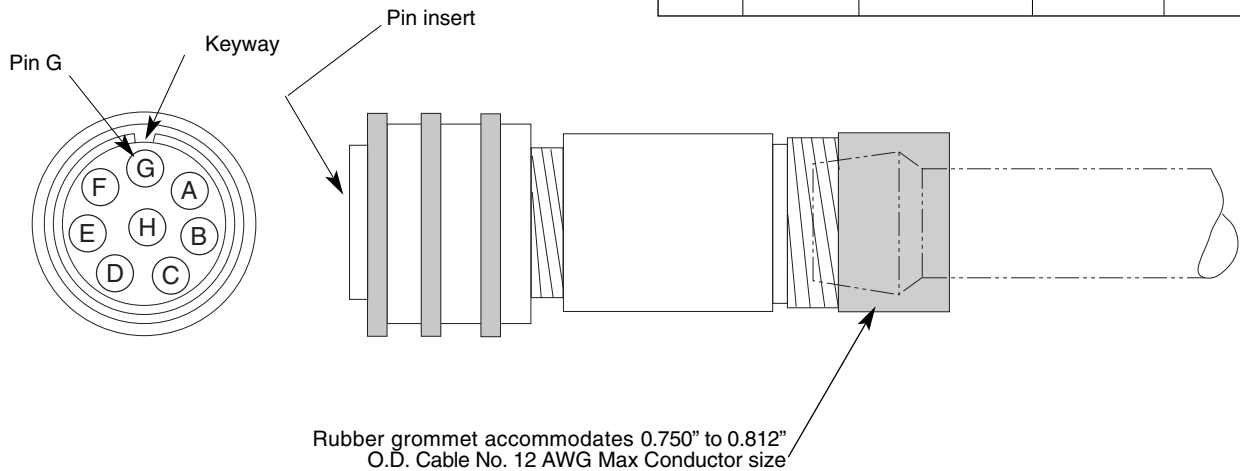


Figure 14.
Auxiliary Switch Connector Plug.

Table 6
Switch Leads to Receptacle Terminals

Switch Stages	Switch Terminal	Receptacle Pin	Switch Contact	
Stage 1	1	A	“b”	Rear Receptacle
	2	B	“a”	
	3	C		
	4	D		
Stage 2	5	E	“b”	Front Receptacle
	6	F	“a”	
	7	G		
	8	H		
Stage 3	9	A	“b”	Rear Receptacle
	10	B	“a”	
	11	C		
	12	D		

Switching positions can be changed from “a” or “b” operation by repositioning the cams inside each switch section. To change any cam position, complete the following:

1. Remove the auxiliary switch cover.
2. Detach the switch from the switch link by removing the groove pin and C-rings.
3. Remove the machine screws attaching the assembly to the cabinet.
4. With the switch removed, unfasten the two hex nuts and lockwashers from the long machine screws that hold the switch sections together.
5. Starting with the rear switch section, lift the cams off the operating shaft, replacing the cams in one of the positions shown in Figure 15.
6. Reposition the switch sections together, reassemble the auxiliary switch, and remount the switch on the sectionalizer.

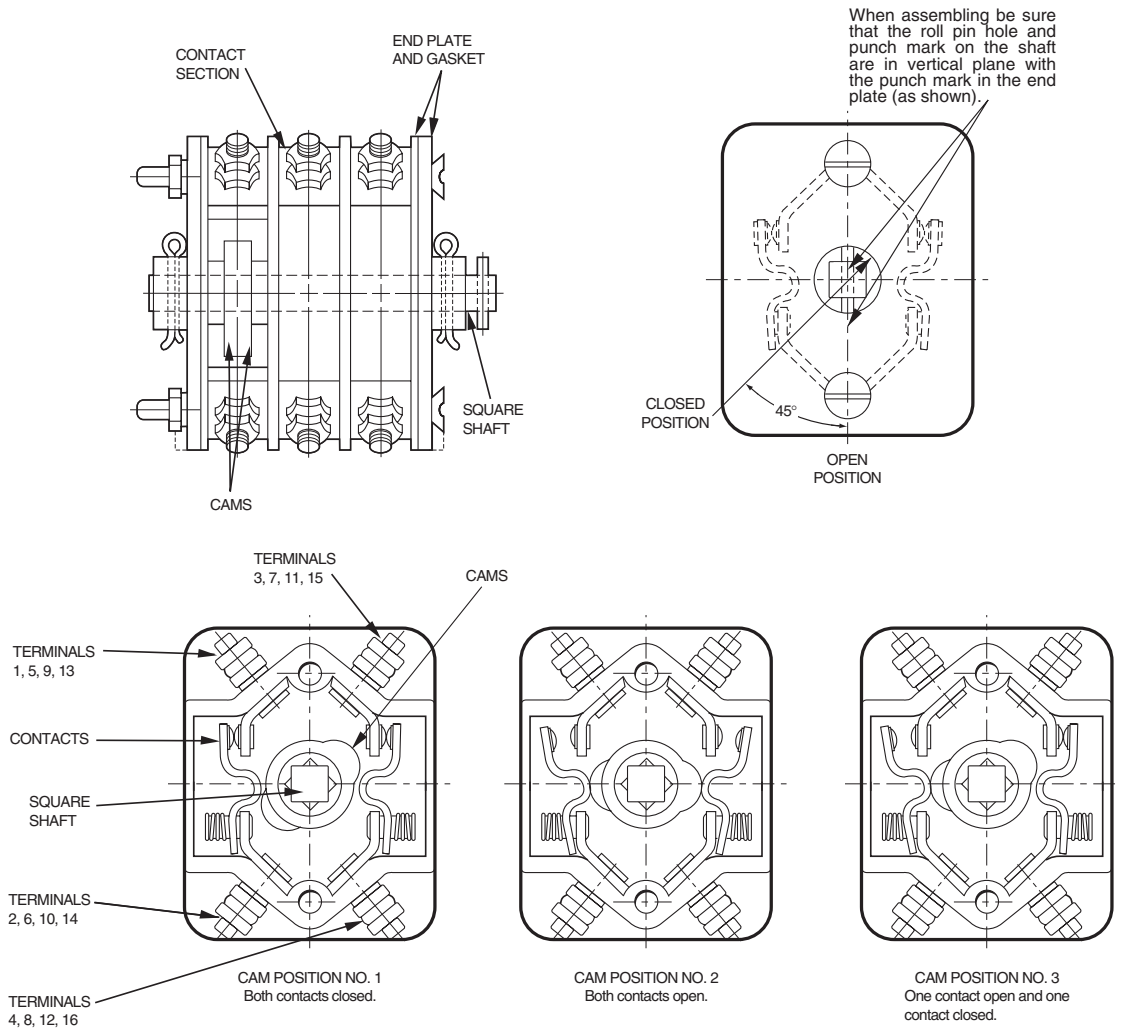


Figure 15.
Cam positions inside the Auxiliary Switch.

OPERATING INSTRUCTIONS

WARNING: This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply can result in death, severe personal injury, and equipment damage. G102.1

WARNING: Do not rely on the open position of the yellow operating handle; it does not ensure that the line has been de-energized. Always establish a visible disconnect. Failure to follow proper safety practices can result in contact with high voltage, which will cause death or severe personal injury. G116.0

WARNING: Always use a hotstick when working with this equipment. Failure to do so could result in contact with high voltage, which will cause death or severe personal injury. G108.1

Initial Operation

With the sectionalizer connected into the system and the source-side high-voltage lines energized, the sectionalizer can be placed into service. Follow approved local practices, which may involve closing the line disconnect switches, closing the sectionalizer, and then opening the bypass circuit.

Routine Operation

Under normal operating conditions, the sectionalizer counts overcurrent interruptions of the backup protective device and automatically opens if the counts registered exceed the control setting. Once open, the sectionalizer will remain open until manually closed. In addition, the sectionalizer can be opened manually by one operation of the yellow pulling of the manual trip rod.

To close the sectionalizer, after either a manual or automatic trip, the gray manual-closing pulling must be operated approximately 10 to 12 times. (When the sectionalizer closes, the resistance on the pulling is eliminated.) This is the only means of closing the sectionalizer.

Automatic Return to Zero Count

A switch operated by the tripping linkage of the sectionalizer mechanism will automatically erase any accumulated counts every time the sectionalizer opens either manually or automatically.

One-Count-to-Open

As an added safety precaution during downline hot-line work, the sectionalizer can be programmed for one-count-to-open without opening the operator mechanism housing and disturbing the normal operating settings. The one-count-to-open lever overrides the COUNTS-TO-OPEN SELECTOR switch to provide the capability of opening the sectionalizer on the first overcurrent interruption. The hookstick-operated lever locks into position when pulled down and must be manually reset.

CT PROTECTOR BOARD

Should the control be removed, the CT protector board, shown in Figure 16, will automatically protect the current sensing CTs. This is done by limiting the open-circuit voltages to non-destructive levels.

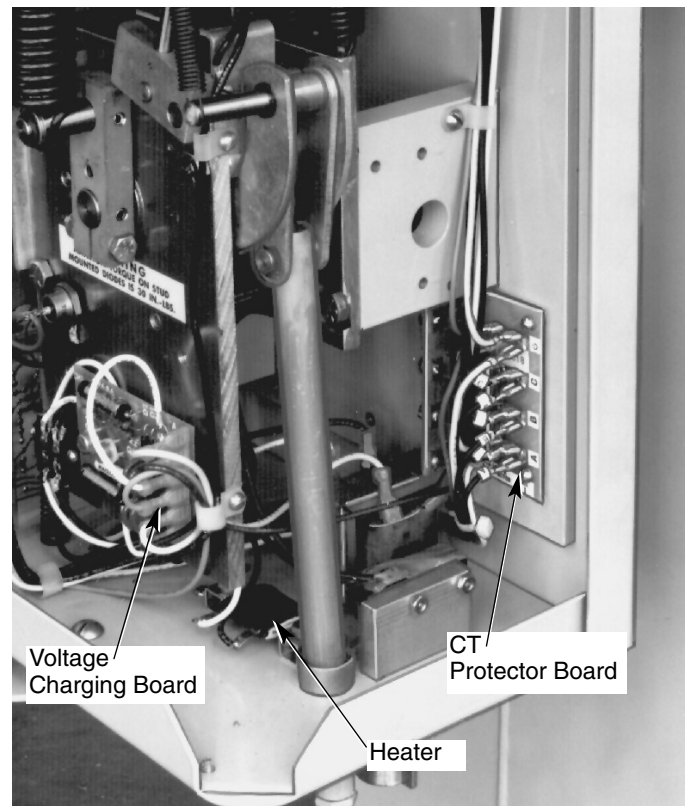


Figure 16.
Control Circuitry.

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TESTING

WARNING: This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply can result in death, severe personal injury, and equipment damage.

G102.1

WARNING: The switchgear and high voltage transformer must be in a test cage or similar protective device to prevent accidental contact with the high voltage parts. Solidly ground all equipment. Failure to comply can result in death, severe personal injury, and equipment damage.

T221.3

Type GV and GW sectionalizers are carefully tested at the factory prior to shipment. Well-equipped test facilities, a detailed testing procedure, and trained test personnel assure that the unit will operate according to published data. Permanent records are kept of each sectionalizer's test performance.

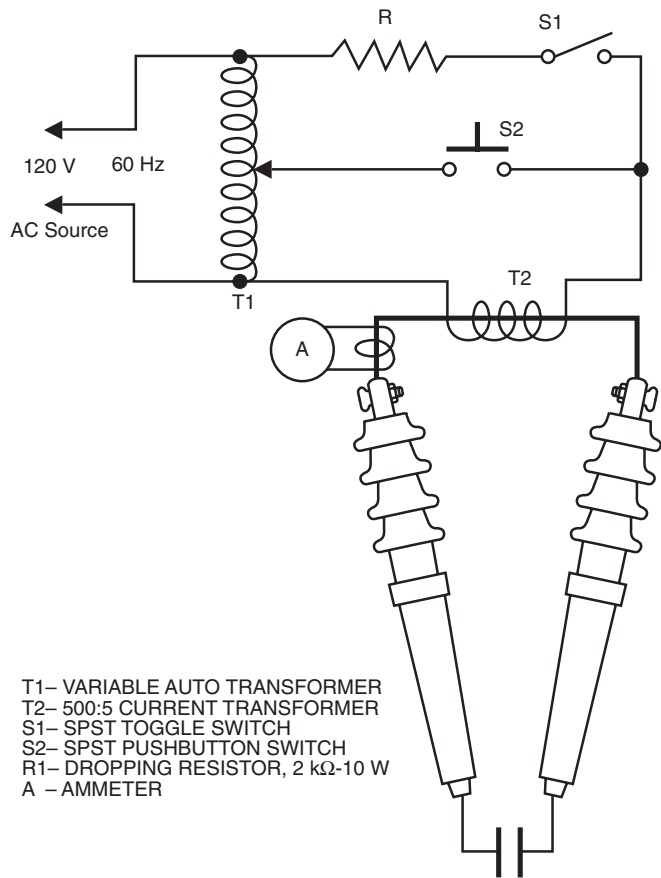
Each sectionalizer leaves the factory ready for installation. Preinstallation testing is not necessary. However, should verification of operation prior to installation be desired, the these procedures should be used.

Test Circuit Equipment

A suggested test circuit is shown in Figure 17. In this test setup, the test current is obtained by back-feeding a 500:5 A current transformer (T2, located in the primary loop of one phase of the sectionalizer) from an adjustable 120 Vac source. The ammeter scales (A) should be selected to accommodate the appropriate range of test currents.

Pre-Test Procedure

Before performing any of the test procedures that follow, make sure the 120 Vac power to the heater and voltage charging board (Figure 15) is disconnected to disable the voltage restraint feature. The sectionalizer will not count as long as the voltage restraint feature (part of the voltage charging board) is energized.



T1- VARIABLE AUTO TRANSFORMER
 T2- 500:5 CURRENT TRANSFORMER
 S1- SPST TOGGLE SWITCH
 S2- SPST PUSHBUTTON SWITCH
 R1- DROPPING RESISTOR, 2 kΩ-10 W
 A - AMMETER

Figure 17.
Test Circuit Schematic.

Test Procedures

While performing the following tests, monitor the continuity between test points C and D on the circuit board. (see Figure 6). If no continuity exists between either set of test points upon closing of the sectionalizer, apply 6 A of load current by closing switch S1 for 3.5 seconds. Once continuity has been restored, open S1 and proceed with the test procedures.

Minimum Actuating Current

The minimum actuating current can be verified by testing at the ± 10 percent values of the phase and ground actuating current ratings.

For example, the minimum actuating resistor rated at 80 A is tested at 72 A (no count) and at 88 A (count registered).



Phase Minimum Actuating Current

When checking the phase minimum actuating current, the ground fault sensing portion of the sectionalizer must be disabled. Testing an individual phase without disabling the ground sensing circuits will cause a false count.

The following procedure is used:

1. Jumper the ground actuating current resistor with a short lead to disable the ground sensing circuit.
2. Jumper terminals P and D together.
3. Program the sectionalizer for one-count-to-open by setting the COUNTS-TO-OPEN SELECTOR switch to 1.
4. Close the sectionalizer by operating the close pulling the required number of times.
5. With the test circuit connected to phase A of the sectionalizer and S1 open, hold S2 closed and slowly raise the test current from zero to the appropriate value shown in Column A of Table 8. Hold S2 closed for at least three seconds.
6. Release S2 to simulate a backup opening. The sectionalizer **should not** open.
7. Close S2 and adjust the test current to the appropriate value shown in Column B of Table 8.
8. Release S2 to simulate a backup opening. The sectionalizer should count the overcurrent interruption and open.
9. Repeat steps 3 through 7 for phases B and C.
10. Remove the jumper from terminals P and D.
11. Remove the jumper from across the ground actuating current resistor upon completion of this portion of the test.

Ground Minimum Actuating Current

To prevent the possibility of a false count, the phase sensing portion of the sectionalizer control circuit should be disabled when the ground minimum actuating current is being checked. The following procedure is used:

1. Jumper the phase actuating current resistor with a short lead to disable the phase sensing circuit.
2. Jumper terminals P and D together.
3. Check that the sectionalizer control is set for one-count-to-open.

4. Close the sectionalizer by operating the close pulling the required number of times.
5. With the test circuit connected to phase A of the sectionalizer and S1 open, hold S2 closed and slowly raise the test current from zero to the appropriate values shown in Column A of Table 8. Hold S2 closed for at least three seconds.
6. Release S2 and simulate a backup opening. The sectionalizer **should not** open.
7. Close S2 and adjust the test current to the appropriate value shown in Column B of Table 8.
8. Release S2 to simulate a backup opening. The sectionalizer should count the overcurrent interruption and open.
9. Repeat steps 3 through 7 for Phases B and C.
10. Remove the jumper from terminals P and D.
11. Remove the jumper from across the phase actuating current resistor.

Table 8
Test Circuit Operating Limits for Actuating Current Settings

Actuating Current Setting (A)	Column A Sectionalizer Must Not Count Below (A)	Column B Sectionalizer Must Count At (A)
3.5	3	4
7	6.3	7.7
16	14.4	17.6
20	18	22
24	21.6	26.4
28	25.2	30.8
40	36	44
56	50.4	61.6
80	72	88
112	101	124
160	144	176
224	201	247
256	230	282
296	266	326
320	288	352
448	403	483
480	432	528
640	576	704

Count Restraint

The count restraint feature prevents erroneous counts of overcurrents interrupted by downline protective devices by blocking the counting operation as long as a minimum of 0.5 A of uninterrupted line current flows through the sectionalizer.

The operation of the count restraint can be verified by superimposing an interruptible overcurrent on a constant minimum line current. The sectionalizer will not count or open on the interruption of the overcurrent as long as the minimum line current is not interrupted. To check the count restraint feature, proceed as follows:

1. Jumper the ground actuating current resistor with a short lead to disable the ground sensing circuit.
2. Jumper terminals P and D together.
3. Check that the sectionalizer control is set for one-count-to-open.
4. Close the sectionalizer by operating the close pulling the required number of times.
5. With the test circuit connected to phase A of the sectionalizer and S1 closed (to simulate a constant load current of approximately 6 A), hold S2 closed and raise the test current to slightly above the appropriate values shown in Column B of Table 8. Hold S2 closed for at least three seconds
6. Release S2 to simulate a downline device clearing the overcurrent. The sectionalizer **should not** open verifying the operation of the count restraint feature.
7. Open S1 and again close and adjust S2 to simulate a backup device clearing the fault. This time the sectionalizer should count the overcurrent interruption and open.
8. Remove the jumper from terminals P and D.

Voltage Restraint

When energized at 120 Vac, the voltage charging board provides fast charging times for the trip energy storage capacitors. It also acts as a voltage restraint; the sectionalizer will not count an overcurrent interruption of the protective device unless the voltage at the control is also interrupted. To check the voltage restraint feature, proceed as follows:

1. Jumper the ground actuating resistor with a short lead to disable the ground sensing circuit.
2. Jumper terminals P and D together.

3. Program the sectionalizer for one-count-to-open.
4. Close the sectionalizer.
5. Connect 120 Vac across pins B and D of the 120 Vac input receptacle.
6. With the test circuit connected to Phase A of the sectionalizer and S1 open, Close S2 and raise the current slightly above the appropriate value shown in Column B of Table 8. Hold S2 closed for at least three seconds.
7. Release S2 to simulate a downline device clearing the overcurrent. The sectionalizer **should not** open.
8. Disconnect the 120 Vac from the input receptacle.
9. Again close and release S2. The sectionalizer **should** open.
10. Remove the jumper from terminals P and D.

Number of Counts-to-Open

The number of counts-to-open can be verified by interrupting, the preset number of times, an overcurrent through the sectionalizer. For example, with the control set for three counts, the sectionalizer will open upon the third overcurrent interruption. Proceed as follows:

1. Jumper the ground actuating current resistor with a short lead to disable the ground sensing circuit.
2. Jumper terminals P and D together.
3. Program the sectionalizer for three counts-to-open by setting the COUNTS-TO-OPEN SELECTOR switch to **3**.
4. Close the sectionalizer by operating the close pulling the required number of times.
5. With the test circuit connected to phase A of the sectionalizer and S1 open, close S2 and raise the test current to slightly above the appropriate value shown in Column B of Table 8. Hold S2 closed for at least three seconds.
6. Open and close S2 a number of times. The sectionalizer should open upon the third opening of S2.
7. To verify the two-counts-to-open setting, set the COUNTS-TO-OPEN SELECTOR switch to **2** and repeat steps 3 through 5. The sectionalizer should open upon the second opening of S2.
8. Remove the jumper from terminals P and D.

Count Reset

The count reset feature resets the sectionalizer count to zero whenever current below the actuating level flows through the sectionalizer for longer than the programmed reset time without interruption. The reset time settings have a tolerance of ± 10 percent.

It can be verified by interrupting an overcurrent flow through the sectionalizer one time less than the counts-to-open setting, then allowing load current to flow for periods just under and just over the reset setting. The sectionalizer should open if the overcurrent for the final count is interrupted within the reset time period (count has reset to zero). The following procedures may be used to verify the count reset:

1. Jumper the ground actuating current resistor with a short lead to disable the ground-sensing circuit.
2. Program the sectionalizer control for two counts-to-open and set the COUNT RESET SELECTOR to 15 seconds.
3. Jumper terminals P and D together.
4. Close the sectionalizer.
5. With test circuit connected to phase A of the sectionalizer and S1 open, close S2 and raise the test current to slightly above the appropriate value shown in Column B of Table 8. Hold S2 closed for at least three seconds.
6. Release S2 to simulate a backup protective device clearing the overcurrent. The sectionalizer will register a count.
7. Close S1 for 13.5 seconds.
8. Momentarily close and then release switch S2. The sectionalizer **should** open, verifying that the count reset has not been activated.
9. Reclose the sectionalizer and then close and release S2 once to register one overcurrent interruption count.
10. Close S1 for slightly more than 16.5 seconds.
11. Momentarily close and release switch S2. The sectionalizer **should not** open, verifying that the count reset has been activated and the first count has been erased.
12. Again, close and release S2. The sectionalizer **should** open.
13. Remove the jumper from terminals P and D.

Inrush-Current Restraint

The inrush-current restraint feature distinguishes between fault currents and inrush currents. For fault current interruptions, the sectionalizer counts and opens normally. For an inrush-current condition, the phase and ground minimum actuating current detection is blocked for three seconds to prevent counting the inrush current.

The three-second time interval allows for system inrush parameters to stabilize prior to allowing the sensitivity of the sectionalizer to return to its programmed state.

The operation of the inrush-current restraint can be verified by simulating a fault condition (the overcurrent is preceded by an overcurrent interruption) and an inrush condition (the overcurrent is preceded by a load current interruption).

The following procedure can be used to verify the inrush-current restraint feature.

1. Jumper the ground actuating current resistor with a short lead to disable the ground sensing circuit.
2. Set the COUNTS TO OPEN SELECTOR switch to 1.
3. Manually close the sectionalizer.
4. With the test circuit connected to phase A of the sectionalizer and S1 open, hold S2 closed and raise the test current to slightly below the appropriate value shown in Column A of Table 8.
5. Release S2 to simulate a backup opening with only load current flowing through the sectionalizer when current was interrupted. The sectionalizer **should not** open.
6. Close S2 and in **no more than three seconds** adjust the test current to just below twice the appropriate value shown in Column A of Table 8 to simulate an inrush condition. Release S2. The sectionalizer **should not** open, verifying that the inrush restraint feature has been activated.
7. Reset the inrush restraint as follows:
 - A. Short test terminals D and P together.
 - B. Close S1 closed for 3.5 seconds.
 - C. Open S1 and remove short from Test Terminals D and P.
8. Close S2 and raise the test current to slightly above the appropriate value shown in Column B of Table 8.
9. Release S2 to simulate a backup opening with fault current flowing through the sectionalizer when current was interrupted. The sectionalizer **should** open.
10. Close the sectionalizer.
11. Repeat step 9 to simulate a fault condition.
12. Release S2. The sectionalizer should open verifying that the inrush restraint has not been activated.

Post-Test Procedures

After testing has been completed, make sure that the control settings are programmed to the operating parameters as originally specified.



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