Optimal Series

Automatic Transfer *Switch*

Installation and User Manual for the
OPT3225 *Automatic Transfer Switch*

Full Version

File: OPT3225 Rev1.5.doc
Nov. 18, 2004

Thank You For Purchasing This DynaGen Product

Please Read Manual Before Installing Unit

Receipt of Shipment and Warranty Return Information

Upon receipt of shipment, carefully remove the unit from the shipping container and thoroughly examine the unit for shipping damage. In case of damage, immediately contact the carrier and request that an inspection report be filed prior to contacting DynaGen.

All returned items are to be shipped prepaid and include a Return Material Authorization (RMA) number issued by DynaGen. RMA forms are available by contacting DynaGen Technical Support through the contact methods listed below.

Limited Warranty

DynaGen will repair or replace any Optimal Transfer Switch which proves to be defective under normal and proper use within **Three Years** from the date of shipment. This constitutes the only warranty and no other warranty shall be implied.

We welcome your comments and suggestions. Please contact us at:

DynaGen Technologies Inc.
Phone: 1-888-396-2436
(902) 562 0133
Fax: (902) 567 0633
Email: support@dynagen.ca
WEB SITE: www.dynagen.ca

Table of Contents

1: GENERAL DESCRIPTION

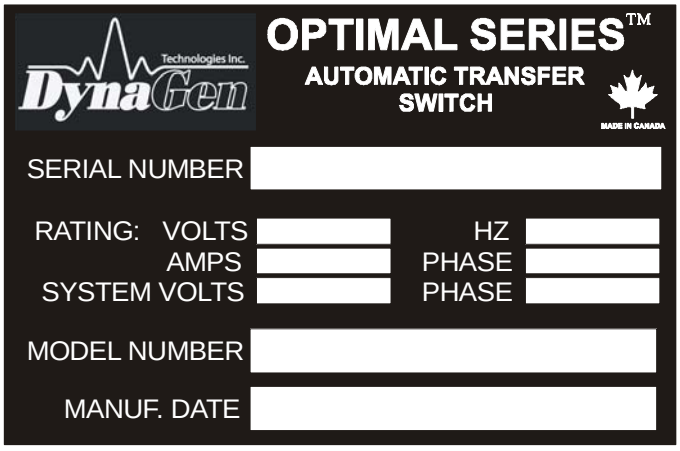
1:1 Switchgear:

The OPT3225 transfer switch mechanism consists of a basic mechanical switching assembly that can be configured to satisfy various application requirements. This manual describes the following models:

OPT3225-2-120/240V-E
OPT3225-3-208/240V-E

1:1:1 Specifications for OPT3225 models

Please refer to the following Optimal Series Automatic Transfer Switch rating label located on switch for proper ratings associated with your specific model.



WARNING: Never exceed the voltage and amperage ratings of the transfer switch.

1:1:2 Operation:

The OPT3225 includes the suitable sensing circuitry for automatic transfer of an electrical load to a stand-by power supply in the event of a drop or loss of voltage of any or all phases of the normal power supply. Upon the restoration of the normal supply, the electrical load is automatically re-transferred to the normal power supply. The normally required time delay functions are all included in the Timer Module package.

The transfer motor utilizes power from the source to which the electrical load is being transferred. The mechanism provides an optional mechanical interlock to prevent both switches from being closed at the same time. The OPT3225 also incorporates the basic actuating motor control switches, terminal blocks, and voltage sensing connection points for Utility Line sensing. Provision is also made for manual transfer of the power sources if necessary. The OPT3225 mechanism is a lever-operated device controlled by a 120 volt, 60 HZ 3 amps thermally protected unidirectional gear-motor.

The transfer motor drives a crank, which in turn operates a lever arm, by rolling a steel bushing between the top and bottom parts of the arm assembly. The lever, in turn, operates the two switch handles by means of a unique adjustable nylon nut arrangement. The travel position of the lever arm is detected by two micro switches, which in turn disconnect power to the transfer motor, when appropriate.

1:2 **Relay Board Module:**

The relay board provides means for automatic transfer of a utility source of power to an emergency source of power, upon loss of the utility, and switches back again, upon restoration of the utility. The relay board has no built in delays for transfer. Any required delays must come from an external source (ie. engine controller, timer module).

1:2:1 Sensing:

The relay board module provides 2 types of voltage sensing:

i). Relay Coil Sensing:

When the slide switch, located on the relay module, next to the 8 pin octal socket, is in the ON position (position away from the octal socket), utility voltage sensing is provided by means of an on board relay coil. The relay coil characteristics set the pick up and drop out of the main utility source.

ii). Adjustable Voltage Sensing:

When the slide switch, located on the relay module, next to the 8 pin octal socket, is in the OFF position (position closest to the octal socket), the on board relay coil is bypassed, and voltage sensing is provide by a UL approved voltage sensing module, which plugs into the 8 pin octal socket. The adjustable voltage monitor is a single set-point voltage monitor. Input voltages 10% below the set-point range will cause the output contacts to de-energize causing a utility source failure. The adjustable voltage-sensing module recommended for use with the OPT3225-2 Automatic Transfer Switch is the Symcom 201-200-SP-T Rev5.20. The adjustable voltage-sensing module recommended for use with the OPT3225-3 Automatic Transfer Switch is the Symcom 201A.

ADJUSTMENT PROCEDURE

Rotate the line voltage adjustment to the nominal line voltage feeding the transfer switch. The nominal line voltage can be measured between phase A and phase B of the line side inputs on the normal breaker. If the voltage is up to 10% below the adjustable voltage set point, and the LED on the monitor is illuminated, the adjustable voltage monitor is working properly. The voltage sensor can also be factory set to customer specifications. Please note that there will be a 3 second delay between emergency to normal transfer. This can be observed be a flashing LED on the monitor.

1:2:2 System Operation:

WARNING: THE RELAY BOARD IS FACTORY SET FOR 12VDC APPLICATIONS. IF INSTALLING IN A 24VDC SYSTEM, TWO JUMPERS NEED TO BE CUT.

The relay board module has provisions for 12 and 24 VDC operation. The relay board comes factory set for 12 VDC applications. Changing from 12 to 24 VDC will require cutting the 2 jumper wires located next to the 5-position header

2: INSTALLATION INFORMATION

2:1 General

The basic OPT3225 transfer switch includes all control wiring connections. The electrical switchgear should be installed by a certified electrician, and all wiring to/from the unit should agree with all applicable electrical codes, standards, and practices.

An engine controller or timing module (optional) is usually installed at the engine and can also be installed by the electrician.

Interconnecting the engine controller or timer module controller to the transfer switch is done simply with a 5-wire signal cable. We provide 50’ as a standard length with each order, but any length, in 25’ increments can be provided upon request, for a nominal charge.

The “cable assembly” has the transfer switch connector already mounted. Simply install it in the Relay Board receptacle, pass the bare end through an appropriately located hole in the enclosure, and run it to the engine controller or timer module. At the controller, trim the wire to length, strip the color coded wires, and insert them into the appropriate locations of the 5-pin connector on the Engine controller.

2:2 Recommended Upstream Protection

When protected by a circuit breaker or fuse rated at 225A maximum. This switch is suitable for use on a circuit capable of delivering not more than:

10,000A RMS SYMMETRICAL AT 240V

May open circuit above 2,000A

Use copper or aluminum wiring at a minimum 75C rating for power terminals.

All electrical wiring connections have a recommended tightening torque. The following chart shows the required electrical tightening torque to allow safe operation.

Tightening Torque IN-LB	Wire Size / Type
60	Copper – 2AWG to 6AWG Aluminum – 1AWG to 4AWG
200	Copper – 1AWG to 1/0AWG Aluminum – 1/0AWG
250	Copper – 2/0AWG to 300MCM Aluminum – 2/0AWG to 300MCM
150	Connector mounting screws

Wire size range #6 to 300MCM copper and #4 to 300MCM aluminum.

2:3 Open Type Transfer Switches:

Open type options allow transfer switches to be shipped with no enclosures. All open type UL approved transfer switch will be required to be placed in a minimum size enclosure to allow proper spacing between electrical components and the enclosure wall. The following chart shows the minimum required dimensions to allow the safe operation of these Switches.

Transfer Switch Amperage Rating	Enclosure Dimensions (Height x Width x Diameter)
225A	24 x 20 x 6

The transfer switch must be in accordance with the following requirements:

For models OPT3225-2-120/240V and OPT3225-3-208/240V

1. The minimum spacing requirements per UL-1008 must not be less than 1/4” through air and 3/8" over the surface of the insulating material. These measures must exist between any uninsulated live part and another uninsulated live part of opposite polarity, uninsulated grounded part other tan the enclosure or any exposed metal part.

2:4 Remote test switch installation:

An optional test switch may be installed which allows remote testing of the transfer switch. The purpose of the test switch is to simulate a utility power failure. The remote test switch would be connected to allow 12VDC between the test + and test - location on the terminal block. When the test + and test- contacts on the terminal block are supplied with12VDC, a relay energizes simulating a utility power failure. A test switch rated at a minimum of 1A should be used.

3: REPLACING PARTS

WARNING: When replacing any parts of the mechanism, isolate the transfer switch from all possible sources of power.

The OPT3225 transfer switch mechanism has been designed to allow all components to be accessible and readily removable from the front of the back panel.

Replacement parts should be identified with reference to the Parts List on page 10 and the Assembly Drawing on page 14. All parts are available direct from the factory. Be sure to state the model and serial number of the switch.

3:1 REPLACEMENT PARTS LIST

PARTS DESCRIPTION	Ref. No.	PARTS DESCRIPTION	Ref. No.
Inner Panel	1	Washer 1/4“ flat	39
Molded Case Switch	2	Hand knob	40
Screw 1/4”- 20x3” round HD phillips	3	Buss cable	41
Washer 1/4" spring lock	4	Neutral bar	42
Pivot Support Bracket	5	Neutral block insulator	43
Screw 10-24x5/8" pan head phillips	6	Screw 1/4"-20x1/2" flat head Flat Head	44
Washer #10 spring lock	7	Neutral lug	45
Washer #10 flat	8	Screw 1/4"-20x5/8" flat head Flat Head	46
Motor Support Bracket	9	Screw 3/8“x5/8”	47
Gear Motor	10	Washer 3/8“ spring lock	48
Screw 8-32x5/16" pan head phillips	11	Load lug	49
Washer #8 spring lock	12	Interlock bracket	50
Screw #10x24x2 1/2” round head square drive	13	Interlock side plate	51
Spacer #10x1” aluminum	14	Washer shoulder	52
Spacer #10x15/16” aluminum	15	Clevis pin	53
Washer 5/16“x1/16” Nylon	16	Fastener springrip	54
Crank	17	Washer shoulder	55
Screw 10-32x1/4"	18	Interlock plunger	56
Cam	19	Spacer #6	57
Screw #6-32 x 1/2" flat HD	20	Screw #6-32 x 3/4"	58
Bearing Bushing	21	Washer #6 spring lock	59
Bearing	22	Washer #6 flat	60
Screw 1/4"-20x1/2" flat head Flat Head	23	Nut #6-32 hex	61
Limit switch	24	Screw 3/8”-16x7/16” flat HD Siemans	62
Screw #4-40x3/4"	25	1/4-20x1/2” Screw	63
Washer #4 Spring Lock	26	Limit switch insulator	64
Washer #4 flat	27		
Lever Arm	28		
Screw 3/8“x1 1/4“ Shoulder	29		
Spring 3/8“ disc	30		
Washer 3/8“ flat	31		
Washer shoulder	32		
Washer 5/16“ spring lock	33		
Nut 5/16”-18 hex	34		
Screw #10-24x3/4” set	35		
Nut #10-24 tamper proof	36		
Nut #10-24 nylon cap	38		

3:1 MAIN SWITCH REMOVAL AND REPLACEMENT

<u>WARNING:</u> When replacing any parts of the mechanism, isolate the transfer switch from all possible sources of power.

To remove the main normal or emergency switches, first electrically isolate the transfer switch from all power sources.

a) Disconnect all cables and wiring from the switch terminals

b) Remove the switch operating arm assembly by removing the pivot/arm 3/8x1 ¼" screw (mechanical assembly reference # 29). A wrench is required to secure the 5/16-18 hex nut (mechanical assembly reference # 34) directly beneath the pivot bracket. The arm assembly can now be easily removed by simply lifted off the mechanism.

c) After the removal of the buss bars, the individual switches can now be readily unfastened and removed from the back panel.

Replacement is the reverse of the above procedure. Note when replacing the arm assembly, ensure that the switches are set one "off" and one "on" and that the nylon switch adjustments on the arm equally straddle the switch operating levers. Tighten the pivot/arm screw securely to ensure proper operation of the arm. Please note that the switch adjustments may need to be independently adjusted when replacing breakers. The adjustments may be performed as follows:

1. To give maximum travel of the lever arm, position the crank block at a 90-degree angle in relation to the lever arm.

2. Using the proper tools, loosen the #10 tamper proof nut (mechanical assembly reference # 36) and turn the #10 set screw (mechanical assembly reference # 35) until the nylon nut tightens against the breaker lever. Tighten the tamper proof nut to secure the adjuster into place. Repeat this step with the other breaker.

3. Manually transfer the switch to the opposite position. Repeat steps 1 and 2 above adjusting the opposite set screws.

4. Check adjustments and repeat if necessary.

3:2 MOTOR REMOVAL AND REPLACEMENT

<u>WARNING:</u> When replacing any parts of the mechanism, isolate the transfer switch from all possible sources of power.

- Electrically isolate the transfer switch from all power sources.
- Note the wire connections to the 12 position connector.
- Remove the arm assembly as previously described.
- Remove four screws securing the motor bracket to the back panel. Please note that two of the four screws will consist each of two different sized aluminum spacers. These spacers will need to be properly placed when reattaching the motor bracket.
- Slightly lift the assembly from the transfer switch.
- Remove the motor connection wires (white and black) by gently removing each of the quick connects from both of the motor terminals.
- Remove the crank and cam assembly by loosening the set screw in the cam arm.
- Remove four screws securing the motor to the underside of the motor bracket. The motor can now be removed.
- Replacement is the reverse of the above procedure. Note that the crank arm must be positioned flush with the end of the motor shaft and the set screw opposite the flat on the shaft

4: MANUAL TRANSFER OF MECHANISM

WARNING: When performing a manual transfer of mechanism, isolate the transfer switch from all possible sources of power.

PRECAUTION HAS TO BE TAKEN WHEN PERFORMING THIS TRANSFER: THE TRANSFER SWITCH MUST BE ISOLATED FROM ALL POSSIBLE SOURCES OF POWER.

The OPT3225 includes the suitable sensing circuitry for automatically transfer an electrical load to a stand-by power supply in the event of a drop or loss of voltage of any or all phases of the normal power supply. If for any reason the switch fails to transfer when the normal power supply fails, the user may manually transfer the switch by using the knob on the lever arm. Please confirm that the transfer switch is isolated from all power sources before manually transferring from the normal to emergency position. Significant force must be supplied to the lever arm knob to perform the transfer. When performing a mechanical transfer both breakers must be properly activated, this can be achieved by the presence of two clicks that will confirm a successful transfer. If the switch fails to transfer back to the normal position when the utility power is restored, manually transfer back to normal supply using the precautions described above. Confirm the proper shut down of the generator or manually shut down if required. The switch should only need to be transferred manually in the event of a failure within the OPT3225 controls. Please call technical support if any transfer failures are observed.

5: RECOMMENDED MAINTENANCE

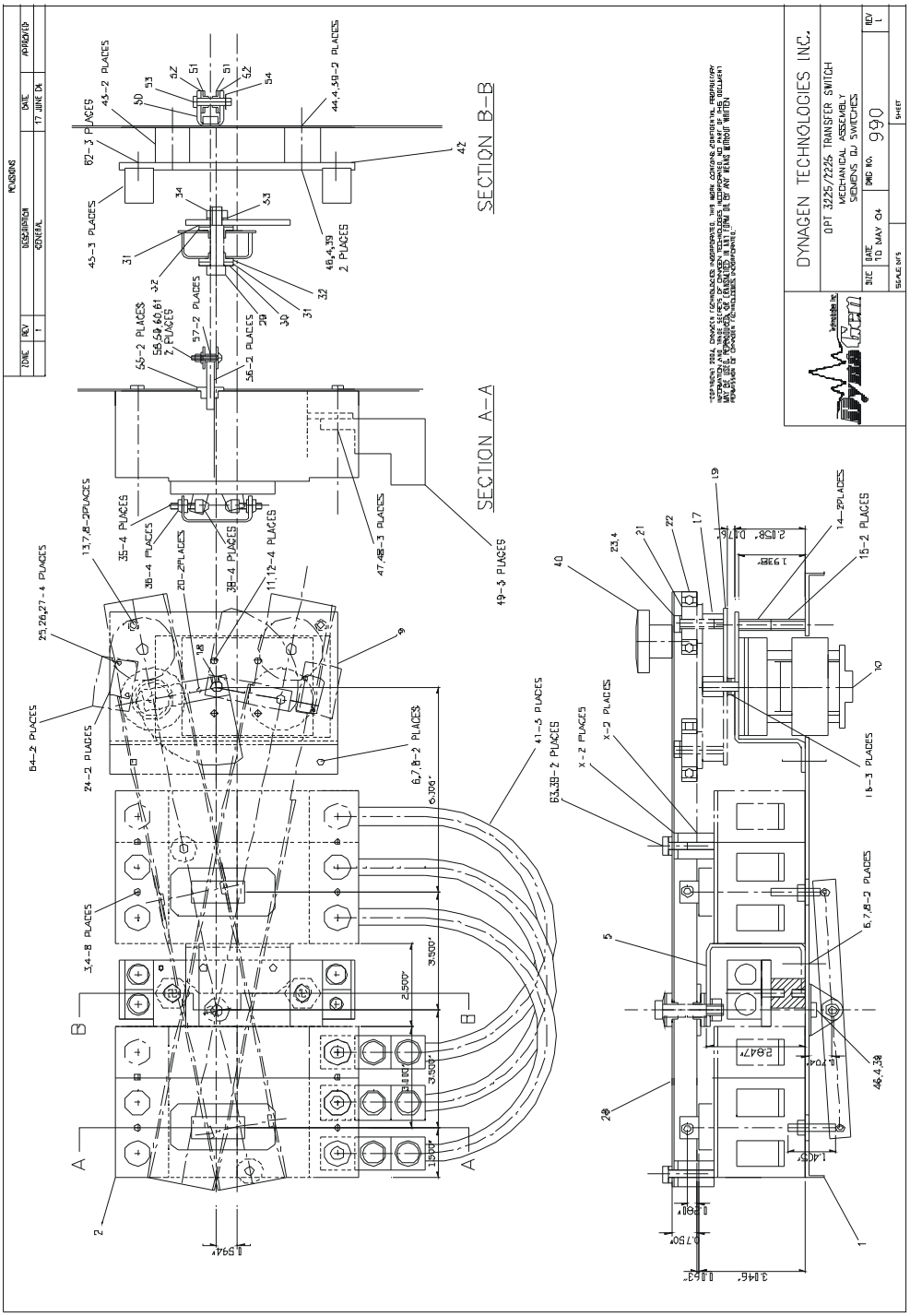
WARNING: When performing any maintenance of the mechanism, isolate the transfer switch from all possible sources of power.

The OPT3225 transfer switch assembly has been designed to require minimum attention under all environmental conditions normally encountered. All sliding and bearing surfaces have a thin coating of grease applied at the factory. This thin coating minimizes accumulation of dust and grit at these locations. The gear-motor is also lubricated for the life of the unit, and requires no attention.

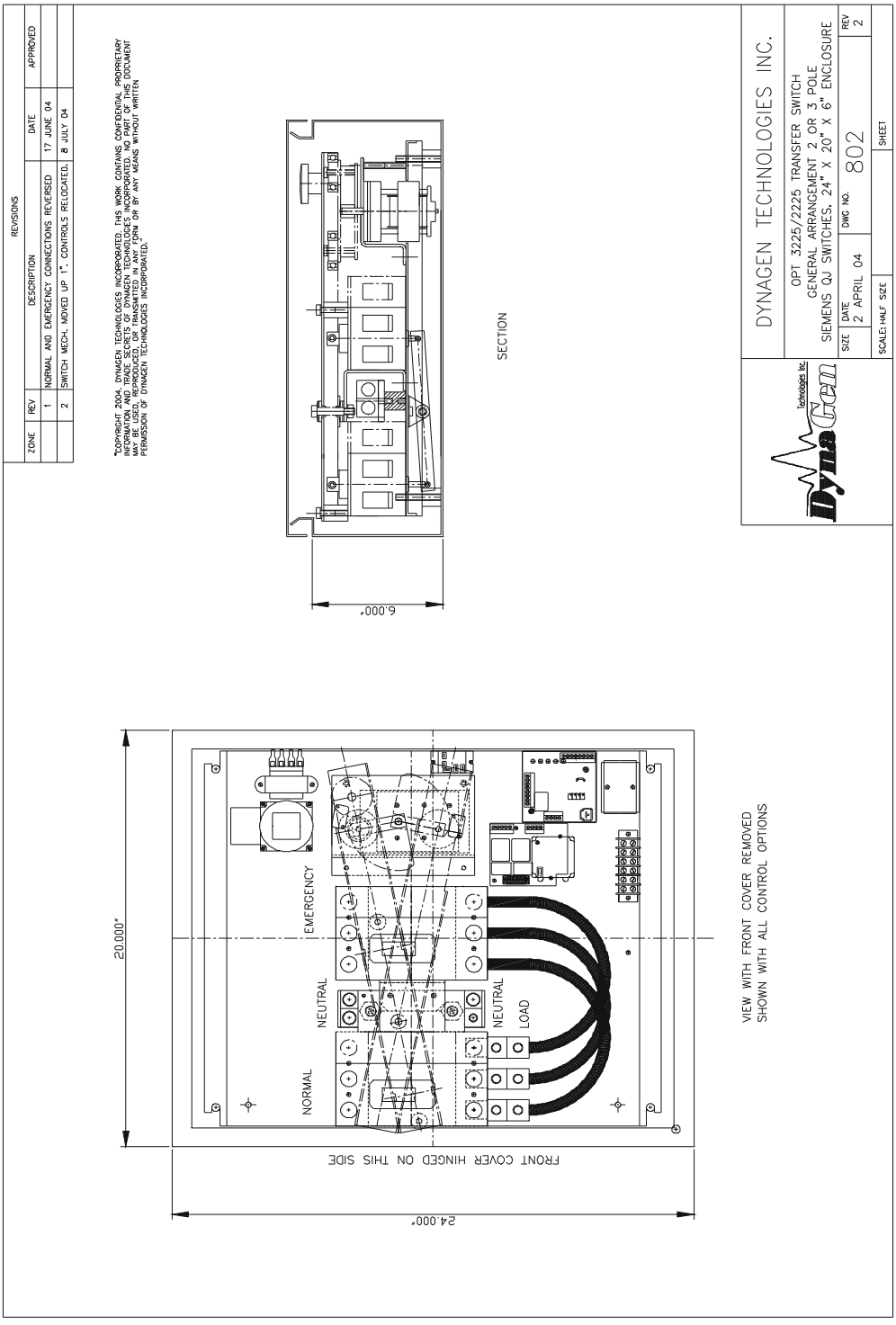
Periodically inspect all terminals (load, line and control), and all fasteners for tightness.

Test the transfer switch operation upon initial installation, in both the motor and manual modes. Periodically check for freedom of movement of the mechanism, hidden dirt or corrosion, and any excessive wear on the mechanical operating parts. Clean or replace parts when necessary.

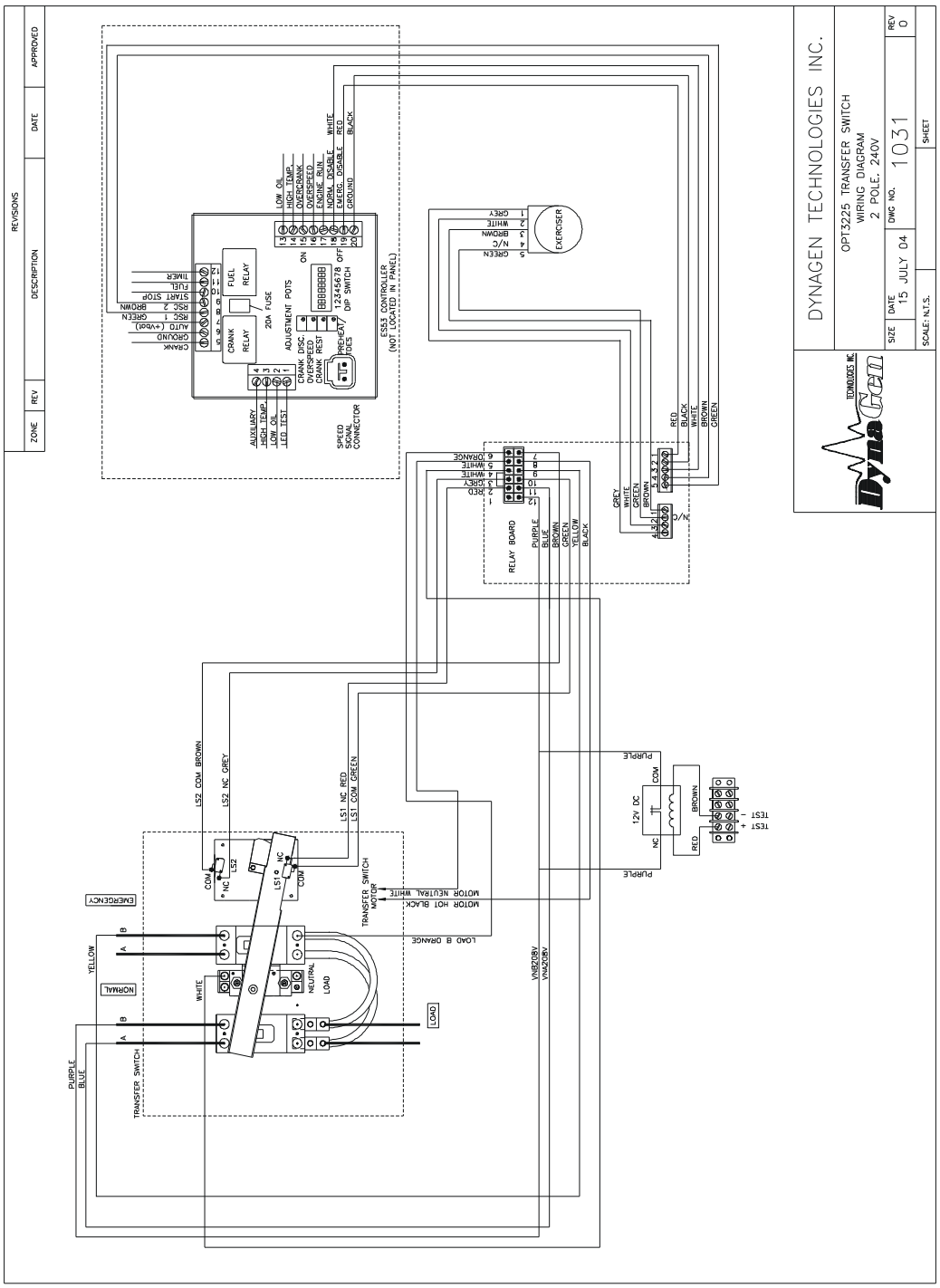
6:1 OPT3225 MECHANICAL ASSEMBLY



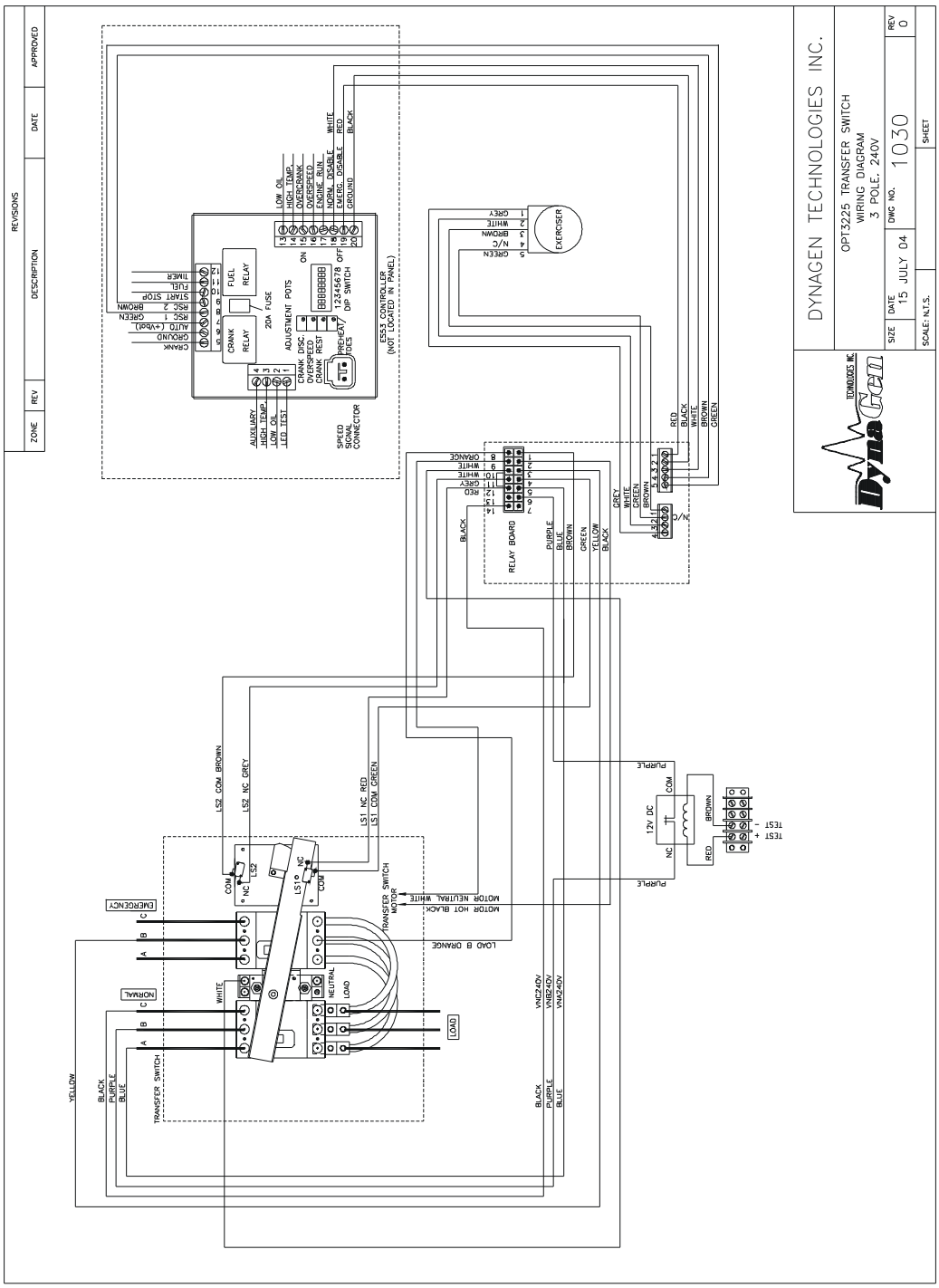
6:2 OPT3225 GENERAL ARRANGEMENT



6:3 OPT3225-2 WIRING DIAGRAM



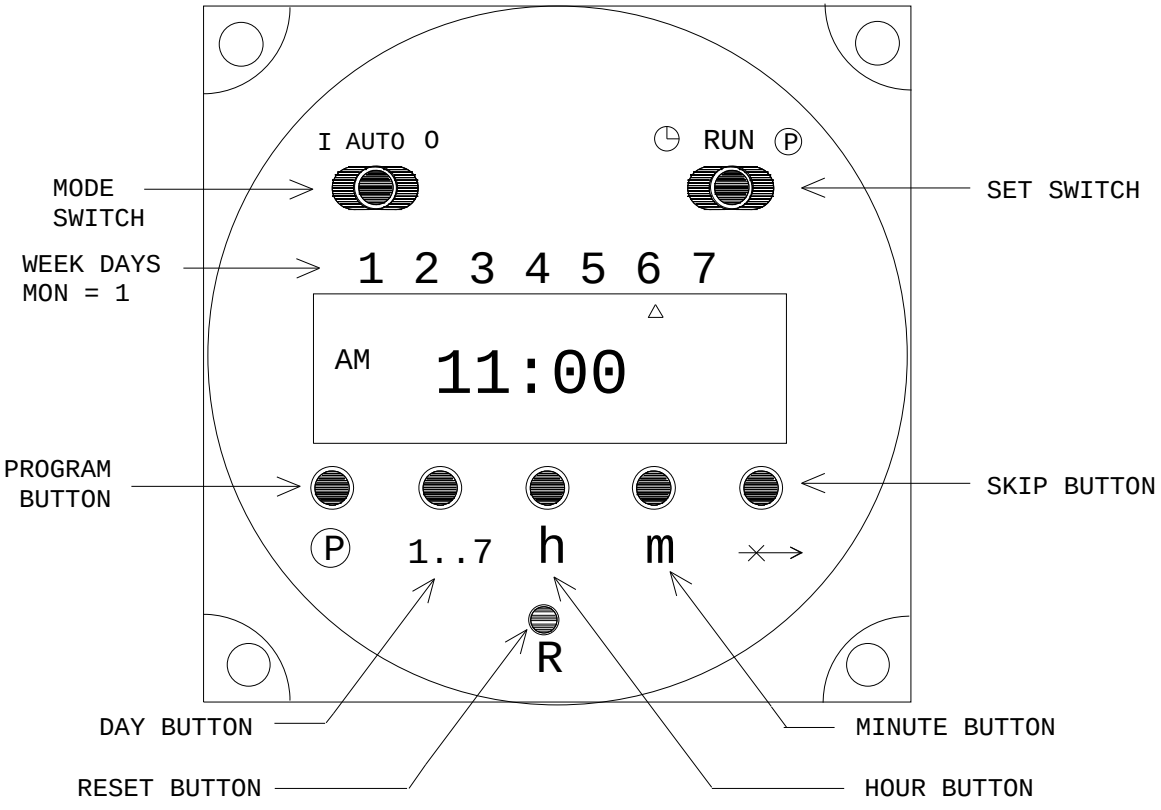
6:4 OPT3225-3 WIRING DIAGRAM



7: ENGINE EXERCISER

Introduction

The functions of the exerciser time clock are shown in the diagram below. The time clock has two slide switches with three positions: The switch in the upper right corner is a SET SWITCH used to set the present time and day for your locality, run the program, change an existing exercise cycle or start a new program. The MODE SWITCH located in the upper left corner can start the generator manually, exercise the generator automatically, or disable the exerciser function. The push buttons below the clock display are used to program the exercise day, time and duration. The SKIP BUTTON is used to ignore an "exercise" day. The RESET BUTTON initializes the time clock erasing any previous program.



Programming the Exerciser Time Clock

The mode switch slider is in the **O** or "disable" position when packaged at the factory. The set switch is in the "run" position.

Use the following steps to program the exerciser time clock for a particular exercise day, time, and duration:

1. Move MODE SWITCH to "auto" and the SET SWITCH to "run".

2. Press the RESET BUTTON using the tip of a pencil or pen. This operation will produce a blinking display showing "00:0" for the time and an arrow under the day 7 (Sunday).

3. Move the SET SWITCH slider to the left (clock icon) position so the present day and time can be set. A default time AM 12:00 appears in the display with an arrow under the day 7 or Sunday.

4. Press the DAY button (1..7) repeatedly until the arrow points to the actual day of the week.

5. Press the HOUR button (h) repeatedly until the actual time of day is displayed, such as AM 5:00 or PM 5:00.

6. Press the MINUTE button (m) repeatedly until the minute of the present hour is displayed, such as AM 5:30 or PM 5:30.

7. Move the SET switch slider to the "run" position. The present time is displayed with the clock colon "**:**" blinking in one-second intervals. The arrow appears continuously under the present day.

8. Move the SET switch slider to the "program" position (P in a circle). The default time for starting an exercise is AM 12:00. The day arrow is absent. A small 1 appears to the right of the time with a lamp symbol above the 1. The 1 (or odd number) indicates the start of an exercise or contact closure. The lamp symbol indicates that the exerciser contacts are closed.

9. Press the DAY button (d) repeatedly until an arrow appears under the desired exercise day (Monday = 1) for starting the exercise.

10. Press the HOUR button repeatedly until the desired time for beginning the exercise is displayed, such as AM 5:00 or PM 5:00.

11. Press the MINUTE button repeatedly until the minute of the hour for beginning the exercise is displayed, such as AM 5:30 or PM 5:30.

12. Press the PROGRAM button **once more** to set the day and time for ending the exercise. A default time AM 12:00 appears in the display. A small 2 appears to the right of the time. The lamp symbol is absent. The 2 (or even number) indicates the end of an exercise or open contacts. The absence of the lamp symbol indicates when the exerciser contacts will open.

13. Press the DAY button repeatedly until an arrow appears under the desired day for terminating the exercise (Monday = 1) as in step 9.

14. Press the MINUTE button repeatedly until the desired minute of the exercise termination hour is displayed, such as AM 5:40 or PM 5:40.

15. Move the slider on the SET switch to the "run" position. The exerciser time clock is now programmed to start the emergency generator at the desired day, time and for the desired duration.

NOTE: *It is possible to program one to eight "on - off" cycles or transitions for the following day combinations: One to eight "on-off" cycles any day of the week; One to eight "on-off" cycles Monday to Friday inclusive; One to eight "on-off" cycles both Friday and Saturday only; One to eight "on-off" cycles Monday to Saturday inclusive; One to eight "on-off" cycles Monday to Sunday inclusive; All day combinations can have any combination of "on -off " cycles.* ***Normally the exerciser time clock will only require one "on-off" cycle once per week.*** The programming steps given above describe how to exercise the generator once a week. **EXAMPLE:** Suppose that the desirable day and time for exercising the generator is Saturday at 5:00 AM. Move the slider of the SET SWITCH to the right (P in circle) position. Press the DAY BUTTON (1..7) repeatedly until the arrow appears under day 6. Press the HOUR BUTTON (h) followed by the MINUTE BUTTON repeatedly until the desired time ^{AM}5: 30 are displayed. The generator is to be shut down after exercising for 10 minutes. With the slider of the SET SWITCH still in the right (P in circle) position press the PROGRAM BUTTON **once**. The display will show a continuous default time of ^{AM} 12:00. The day arrow(s) disappears. The small 1 will change to a 2 and the lamp symbol disappears. Press the DAY BUTTON (1..7) again repeatedly until the day arrow appears under day 6. Press the HOUR BUTTON (h) followed by the MINUTE BUTTON again repeatedly until the desired time ^{AM}5: 40 are displayed. Return the SET SWITCH slider to the "run" position. The exerciser time clock is programmed to start the generator at 5:30 AM on Saturday morning and run for 10 minutes then shut down at 5:40 AM of the same day Saturday. Following this procedure, the generator can be exercised as frequently as desired.