

Operation and Maintenance Manual

Automatic Transfer Switches CTG, CTGD Series

TSA1-Up (Automatic Transfer
Switch)

TSB1-Up (Automatic Transfer
Switch)

Important Safety Information

Most accidents that involve product operation, maintenance and repair are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have the necessary training, skills and tools to perform these functions properly.

Improper operation, lubrication, maintenance or repair of this product can be dangerous and could result in injury or death.

Do not operate or perform any lubrication, maintenance or repair on this product, until you have read and understood the operation, lubrication, maintenance and repair information.

Safety precautions and warnings are provided in this manual and on the product. If these hazard warnings are not heeded, bodily injury or death could occur to you or to other persons.

The hazards are identified by the "Safety Alert Symbol" and followed by a "Signal Word" such as "DANGER", "WARNING" or "CAUTION". The Safety Alert "WARNING" label is shown below.

WARNING

The meaning of this safety alert symbol is as follows:

Attention! Become Alert! Your Safety is Involved.

The message that appears under the warning explains the hazard and can be either written or pictorially presented.

Operations that may cause product damage are identified by "NOTICE" labels on the product and in this publication.

Caterpillar cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are, therefore, not all inclusive. If a tool, procedure, work method or operating technique that is not specifically recommended by Caterpillar is used, you must satisfy yourself that it is safe for you and for others. You should also ensure that the product will not be damaged or be made unsafe by the operation, lubrication, maintenance or repair procedures that you choose.

The information, specifications, and illustrations in this publication are on the basis of information that was available at the time that the publication was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service that is given to the product. Obtain the complete and most current information before you start any job. Caterpillar dealers have the most current information available.

WARNING

When replacement parts are required for this product Caterpillar recommends using Caterpillar replacement parts or parts with equivalent specifications including, but not limited to, physical dimensions, type, strength and material.

Failure to heed this warning can lead to premature failures, product damage, personal injury or death.

Table of Contents

Foreword	4
Safety Section	
Safety Signs and Labels	5
General Hazard Information	6
Installation Information	7
Electrical System	7
Product Information Section	
Model Views	8
Product Identification Information	9
Installation Section	
Transfer Switch	12
Controller	17
Maintenance Section	
Maintenance Interval Schedule	20
Service Information Section	
Systems Operation	24
Troubleshooting	30
Reference Information Section	
Reference Materials	36
Index Section	
Index	37

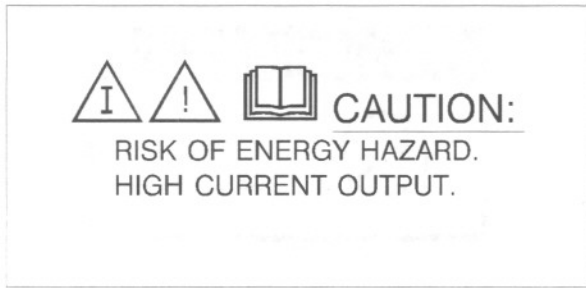


Illustration 5

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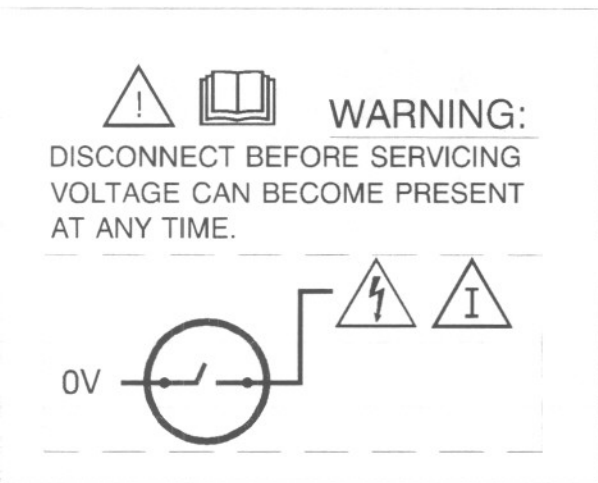


Illustration 6

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General Hazard Information

SMCS Code: 4469

Attach a "Do Not Operate" warning tag or a similar warning tag to the keyswitch or to the controls before the system is serviced or before the system is repaired. These warning tags are available from your Caterpillar dealer. Attach the warning tags to the system and to each operator control station.

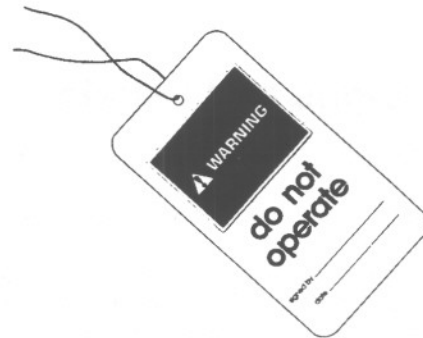


Illustration 7

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Do not allow unauthorized personnel on the system, or around the system when the system is being serviced.

Speeds, temperatures, and load are the best indicators of performance. Rely on instrumentation. Record all readings. Compare these readings with previous readings in order to detect developing abnormalities.

- Wear a hard hat, protective glasses, and other protective equipment, as required.
- Do not wear loose clothing or jewelry that can snag on controls or on other parts of the system.
- Ensure that all protective guards and all covers are secured in place on the system.
- Never put maintenance fluids into glass containers. Glass containers can break.
- Use all cleaning solutions with care.
- Report all necessary repairs.

Unless other instructions are provided, perform the maintenance under the following conditions:

- The system is stopped and the system is disconnected from power. Ensure that the system cannot be powered or ensure that power cannot be applied to the system.
- Do not attempt any repairs that are not understood. Use the proper tools. Replace any equipment that is damaged or repair the equipment.
- Remove all tools, electrical cords, and any other loose items from the system before starting the system.

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Installation Information

SMCS Code: 4469

All electrical equipment that is supplied by Caterpillar should comply with national electrical codes. Also, the equipment should comply with local electrical codes.

Note: In order to allow lockout procedures, all power connections must be wired through external disconnect switches.

A transfer switch must be used in conjunction with any generator that is used for emergency power in the event of a failure of the utility power service. Failure to isolate the normal and standby power sources from each other may result in damage to the standby generator. Failure to isolate the two sources may also result in damage to the standby generator. Failure to isolate the sources may result in injury or death to electric utility workers due to the reverse flow of electrical energy.

Improper installation, operation, or repair of this equipment is extremely dangerous. Improper installation, operation, or repair may result in death, serious personal injury, damage to equipment, or damage to property.

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Electrical System

SMCS Code: 4469

Grounding Practices

Proper grounding is necessary for optimum performance, reliability and safety. Improper grounding will result in uncontrolled electrical circuit paths and in unreliable electrical circuit paths.

Uncontrolled electrical circuit paths can cause electrical activity that may be unsafe. This activity can degrade the electronics and communications.

Ensure that all grounds are secure and free of corrosion. The proper grounding should comply with all local electrical codes.

Product Information Section

Model Views

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Model View Illustrations

SMCS Code: 4469

CTG/CTGD

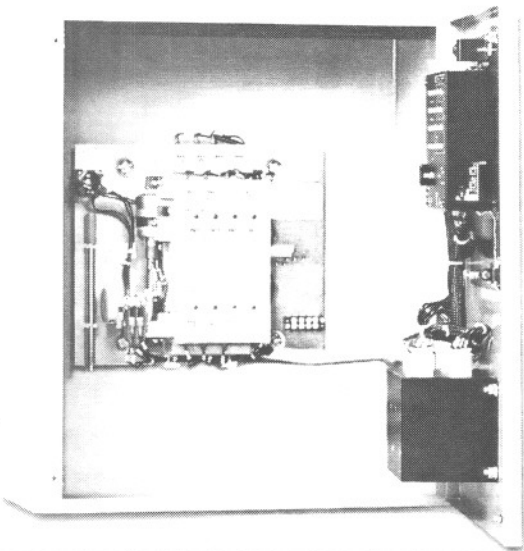


Illustration 8

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Product Identification Information

General Information

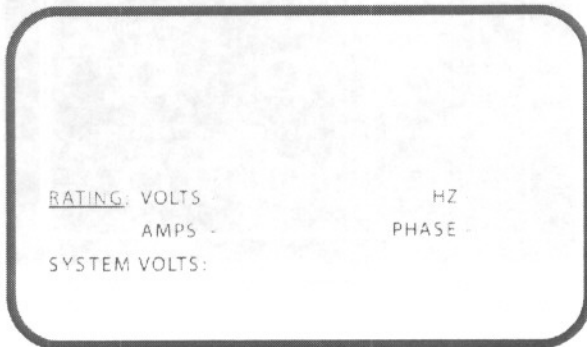
Information Plate

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SMCS Code: 4469

SMCS Code: 4469

Transfer Switch



Caterpillar Transfer Switches are used in order to provide a continuous source of power for lighting and other critical loads. The transfer switch will transfer power from the normal power source to an emergency power source. The transfer of power will take place when the voltage from the normal source falls below a preset limit.

Illustration 9

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The information plate displays the system specifications and specific classifications. The information plate is located on the power panel of the transfer switch. See illustration 9.

A microprocessor is used in order to monitor voltage. Also, the microprocessor is used to control the system. The microprocessor is located on the cabinet door. The microprocessor will provide accurate control of the transfer switch.

All Caterpillar Transfer Switches are designed for use on emergency systems or standby systems. The transfer switches are also rated for total system loads.

Serial Number Plate

This manual provides information on the installation, operation, and maintenance of the switch. A manual is supplied with each transfer switch. The manual details the features of the switch. The manual should be kept in a readily accessible location in order to provide complete reference information about the transfer switch.

CATERPILLAR®

MODEL MODEL MALLI MODEL MODELL	MODEL	MONTEAO MODELLO MODELO MODELO MODELL
SERIENUMMER SERIENUMMER SARJANUMERO NUMERO DE SERIE SERIENUMMER	SERIAL NO.	APIΘMOI IEPAI NUMERO DI SERIE NUMERO DE SERIE SERIENUMMER

CATERPILLAR INC.

Controller

The MX100 controller has three different appearances for the three types of transfer switches: the CTG, the CTG with the A6 option, and the CTGD.

Illustration 10

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The serial number plate gives the model number and the serial number of the unit. The serial number plate is located on the power panel of the transfer switch. See illustration 10.

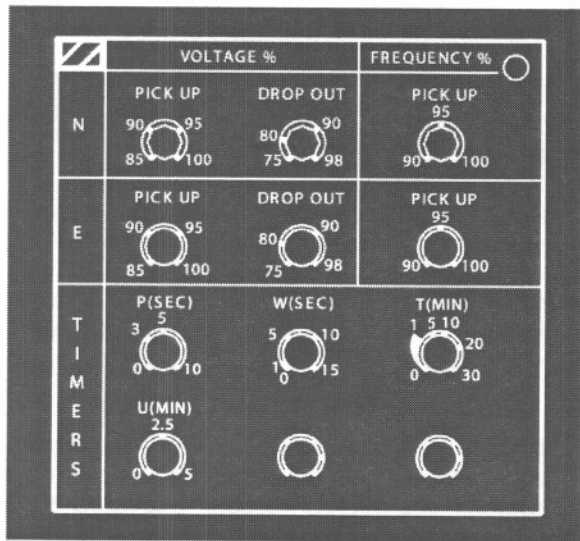


Illustration 11 g00834335

Illustration 11 shows the back of the MX100 controller for the CTG model.

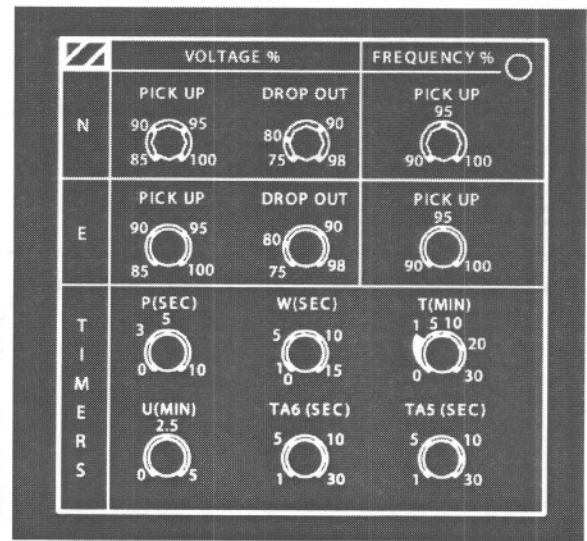


Illustration 13 g00834342

Illustration 13 shows the back of the MX100 controller for the CTG model with the A6 option.

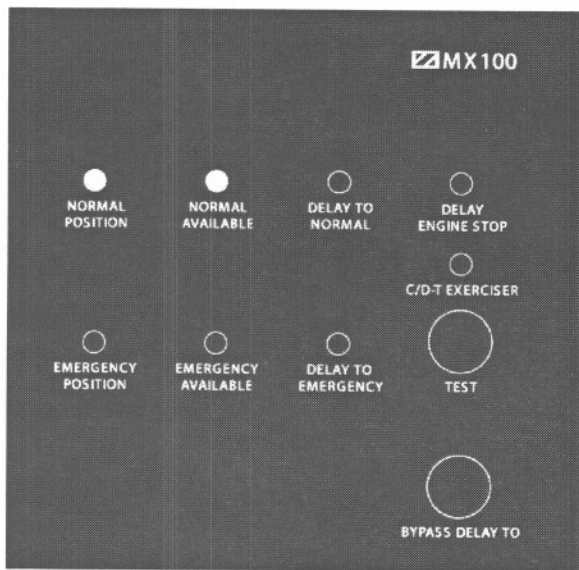


Illustration 12 g00834286

Illustration 12 shows the front of the MX100 controller for the CTG model.

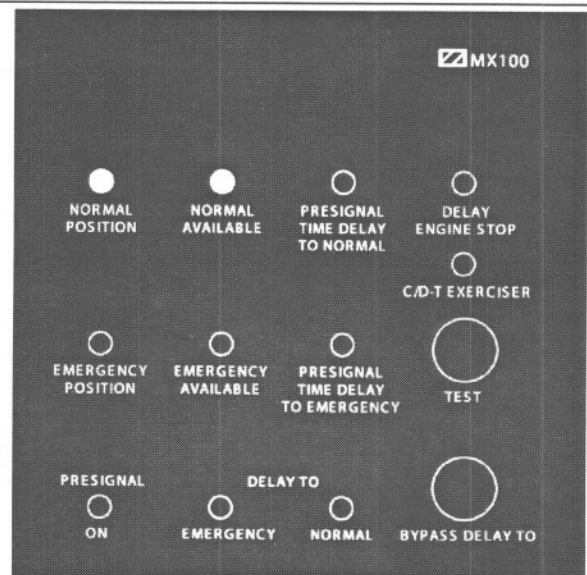


Illustration 14 g00834293

Illustration 14 shows the front of the MX100 controller for the CTG model with the A6 option.

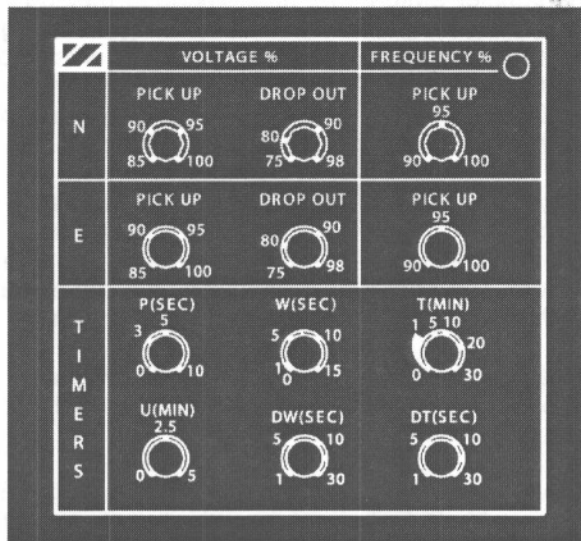


Illustration 15

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Illustration 15 shows the back of the MX100 controller for the CTGD model.

- The output of the engine start relay
- The outputs of the source relays
- Timer that determines the amount of time before transfer
- Pre-signal contact in either direction
- Input that inhibits the transfer to emergency power
- Input that inhibits the transfer to normal power
- Input for Remote Peak test
- Input to transfer off EMERGENCY to dead NORMAL
- the network interface card

The relay transformer box (R/T box) contains the relays that are used in order to energize the transfer mechanism of the transfer switch. The R/T box also contains the transformers that are used to drop the line voltage to a control level for the controller input.

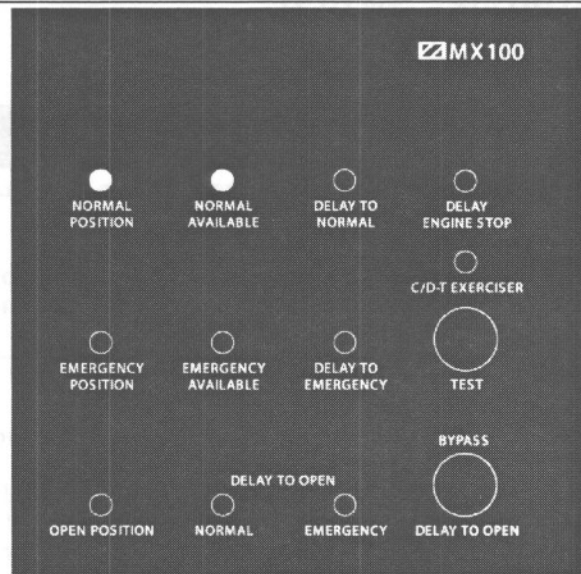


Illustration 16

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Illustration 16 shows the front of the MX100 controller for the CTGD model.

The MX100 Controller consists of two major assemblies: a microprocessor and a relay transformer box.

The microprocessor contains the System I/O Interface.

The System I/O Interface is located on the left hand side of the back of the unit(1). The System I/O Interface has the following accessories:

Installation Section

Transfer Switch

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Receiving Inspection and Storage

SMCS Code: 4469

Carefully unpack the transfer switch. Inspect the transfer switch for any damage that may have occurred during shipment.

Before installation, it is necessary to store the transfer switch in a clean dry place. The transfer switch should be protected from dirt and water. Provide adequate air circulation and heat in order to prevent condensation.

The transfer switch should be stored at a temperature range of -30° to 75°C (-22° to 167°F).

A 40 to 400 Amp molded shell transfer switch should be operated at a temperature range of -20° to 65°C (-4° to 149°F). 40 to 4000 Amp transfer switches of all other frame types should be operated at a temperature range of -20° to 60°C (-4° to 140°F).

The transfer switch should be stored and operated in 5% to 95% humidity.

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Mounting

SMCS Code: 4469

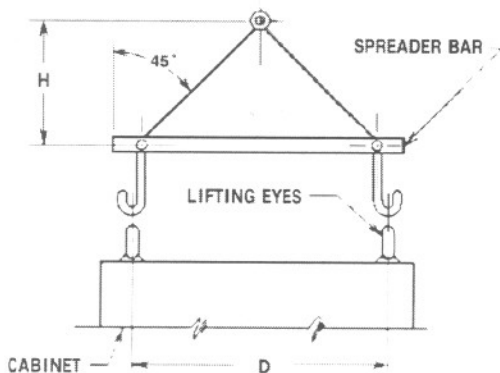


Illustration 17

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An adequate lifting method must be used to mount the transfer switch. The recommended method for moving the transfer switch by using the lifting eyes and a spreader bar is illustrated in illustration 17. Enough room should be allowed to open the cabinet doors fully for inspection and servicing of the transfer switch per NEC and local codes.

Make sure that the conditions of the site are appropriate for the system. There are several different enclosures that can be ordered with the system. The appropriate conditions are dependent on the enclosure that is ordered with the system.

Note: When you lift the transfer switch with a spreader bar, height H must be equal to half of distance D.

Cover the transfer switch before drilling any holes in the cabinet. Failure to cover the transfer switch may result in damage to the switch.

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Power Connections of the Transfer Switch

SMCS Code: 4469

⚠ DANGER

Personal injury or death can result from high voltage.

Make sure the power source is disconnected. Lock out the disconnect switches and tag the switches "DO NOT OPERATE".

Caterpillar transfer switches are supplied with solderless screw type terminals. The terminals are standard for the normal power connection, the emergency power connection, and the load. Table 1 lists the number of cable lugs and the sizes of cable lugs that are supplied for each ampere rating.

Connect the conductors for normal power to the normal power terminals on the transfer switch. Connect the conductors for emergency power to the emergency power terminals on the transfer switch. Then, connect the conductors for the load to the load terminals on the transfer switch. Remove any surface oxides from the cables by cleaning the cables with a wire brush. Verify that all the connections are correct before tightening the lugs. All of the cable lugs must be tightened to the proper torque values. The proper torque values are shown in table 2.

Note: Do not route cables or wiring behind transfer switches that have the connections in the front of the switch.

Table 1

Screw Terminals for External Power Connections				
Switch Size in Amp.	Normal, Emergency, and Load Terminals		Neutral Bar ⁽¹⁾	
	Cable Per Pole	Range of Wire Sizes	No. of Cables	Range of Wire Sizes
40	1	#8 to 1/0 AWG	3	#8 to 1/0 AWG
80	1	#8 to 1/0 AWG	3	#8 to 1/0 AWG
100	1	#8 to 1/0 AWG	3	#8 to 1/0 AWG
150	1	#8 to 3/0 AWG	3	#8 AWG to 300 MCM
200	1	#8 to 3/0 AWG	3	#8 AWG to 300 MCM
225, 250 ⁽²⁾	1	#6 AWG to 250 MCM	3	#6 AWG to 300 MCM
260, 300 ⁽²⁾ , 400	1	#4 AWG to 600 MCM	3	#4 AWG to 300 MCM
600	2	#2 AWG to 600 MCM	8	#2 AWG to 600 MCM
800 1000 1200	4	#2 AWG to 600 MCM	12	#2 AWG to 600 MCM
1600 2000 2600 3000	8	#2 AWG to 600 MCM	12	#2 AWG to 600 MCM

(1) A Neutral Bar is not always required.

(2) IEC ratings only

Table 2

Socket Size Across Flats	Torque	
	N·m (lb in)	lb ft
1/8	5.1 (45)	4
5/32	11.3 (100)	8
3/16	13.5 (120)	10
7/32	16.9 (150)	12
1/4	22.6 (200)	17
5/16	31.1 (275)	23
3/8	42.4 (375)	31
1/2	56.5 (500)	42
9/16	67.8 (600)	50

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Control Connections of the Transfer Switch

SMCS Code: 4469

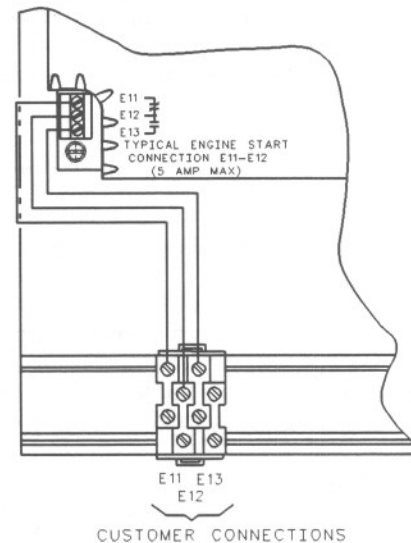


Illustration 18

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Connections for the engine control are located on the lower left side of the MX100. See Illustration 18. Make all other necessary connections for control to the terminal blocks on the control panel per the schematics. See Schematic, RENR5853.

Note: All control wires (12 to 18 AWG) must be torqued to 2.15 N·m (19 lb in).

The terminal for the connection to the output contacts for the EMERGENCY position is provided. The output contacts for the NORMAL position is also provided. These terminals are marked and the terminals appear on the side of the panel. On 400 amp metal frame units, the terminals appear on the bracket above the operator handle.

i01576864

Final Inspection of the Transfer Switch

SMCS Code: 4469

DANGER

Personal injury or death can result from high voltage.

Make sure the power source is disconnected. Lock out the disconnect switches and tag the switches "DO NOT OPERATE".

Before you energize the transfer switch, do the following steps.

1. Remove all of the debris that may have entered the transfer switch during installation. DO NOT use a blower. The use of a vacuum is recommended.

Note: If you use a blower, debris could get stuck in the switch.

2. Verify that all cable connections are correct.
3. Use a phase rotation meter in order to verify that the phase rotation of both power sources match.
4. Check the engine start contacts and verify that the connection of all control wires are correct.
5. Check the settings of the timers. If necessary, adjust the timers. If necessary, adjust any optional accessories. See Service Information, "Timers" for information on setting the timers.
6. Verify the actual torque values of the lugs in order to check the integrity of the power connections. See Installation, "Power Connections of the Transfer Switch".
7. Make sure that all of the covers are installed and properly fastened. Also, make sure that all of the barriers are installed and properly fastened.

Note: During shipping, the transfer switch is in the NORMAL position.

A high potential test is performed at the factory. High potential voltage and megohmmeter tests are not recommended in the field. If you perform a high potential test or you perform a megohmmeter test in the field, disconnect the wiring harnesses from the controller. Also, disconnect the wiring harnesses from the R/T box. If you do not disconnect the controller, the high voltage can damage the controller. Also, if you do not disconnect the R/T box, the high voltage can damage the R/T box.

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Functional Test of the Transfer Switch

SMCS Code: 4469

For the CTSD transfer switches, there is a delay timer which delays the transfer from OPEN to EMERGENCY. There is also a delay timer that delays the transfer from OPEN to NORMAL.

Initial Start-Up

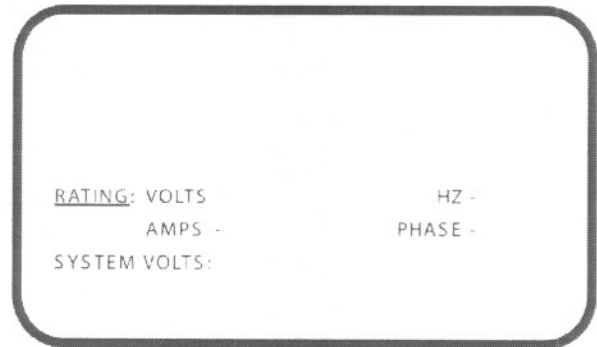


Illustration 19

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Before starting the operation test, check the nameplate rating on the transfer switch in order to verify that the system voltage is correct. An example of the nameplate is shown in illustration 19.

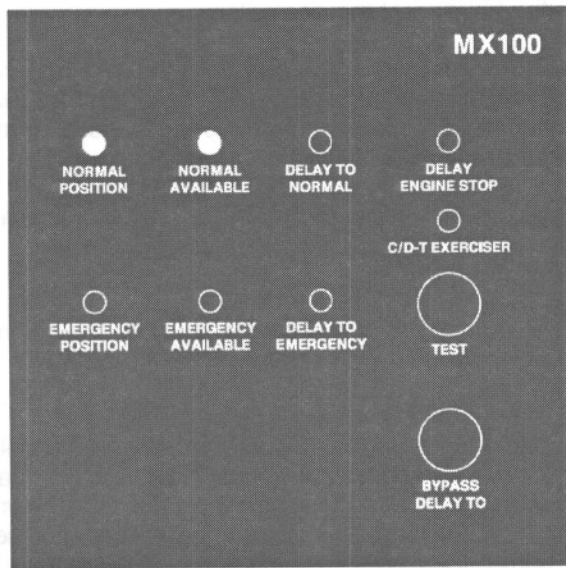


Illustration 20

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Make sure that you have read all of the information about the options and the accessories that are provided on the ATS. Make sure that you understand all of the information about the options and the accessories that are provided on the ATS. After all of the options and the accessories are understood, follow the following steps in order to set up the ATS. Refer to illustration 20. The LED indicators illuminate in order to indicate the following information: the sources that are available, the position of the switch, and the control function of the MX100.

Note: If the LED indicators are flashing, refer to Service Information, "Troubleshooting".

1. If the transfer switch is equipped with the Disconnect Switch ("DS"), turn the switch to the INHIBIT. Close the external circuit breaker for the normal power source. The "NORMAL AVAILABLE" and the "NORMAL POSITION" LED indicators will illuminate. If the "NORMAL AVAILABLE" LED does not illuminate, verify that the source voltage is above the pickup value. On the initial start-up, the "DELAY ENGINE STOP" LED will illuminate for the duration of the engine stop timer.

Note: The generator set will start and the generator set will run while the engine stop timer is running.

2. Close the external circuit breaker for the emergency power source. Start the generator set in the "MANUAL" mode. When the voltage and frequency reach preset values, the "EMERGENCY AVAILABLE" LED will illuminate.

3. Check the voltages at the terminals for the emergency power source. Verify that the phase rotation of the emergency power source is equal to the phase rotation of the normal power source.
4. After the sources have been verified, shut down the generator set. Put the generator set control in the automatic position. The "EMERGENCY AVAILABLE" LED will turn off.

Note: The generator set will continue to run if the "DELAY ENGINE STOP" LED is illuminated.

5. If the transfer switch is equipped with the Disconnect Switch ("DS"), turn the switch to ENABLE. Make a final inspection of the ATS. Close the cabinet door and lock the cabinet door.
6. Run the appropriate test. The appropriate test is determined by the model of the transfer switch.

CTG Test

1. Close the circuit breaker for the normal power source.

The controller will illuminate the "NORMAL AVAILABLE" LED. The "NORMAL AVAILABLE" LED is illuminated in order to show that the normal power source is available.

2. Check the voltages at the terminals for the normal power source.
3. Close the circuit breaker for the emergency power source.
4. Start the generator set.

The controller will illuminate the "EMERGENCY AVAILABLE" LED. The "EMERGENCY AVAILABLE" LED is illuminated in order to show that the emergency power source is available.

5. Check the voltages at the terminals for the emergency power source.
6. Use a phase rotation meter in order to verify that the phase rotation of the emergency power source is equal to the phase rotation of the normal power source.
7. Shut down the generator set.
8. Put the generator set control in the automatic position.
9. Complete a visual inspection of the transfer switch.
10. Close and lock the cabinet door.

11. Initiate the test by pressing the "TEST" button on the keypad of the controller.

Press the test button and hold the test button until the switch transfers to the emergency power source.

Note: Releasing the "TEST" button before the switch transfers to the emergency power source will terminate the test.

12. In order to start the transfer back to the normal power source, release the "TEST" button.

The transfer switch will complete the transfer back to the normal power source after the delay for the transfer to the normal power source has elapsed. The engine cooldown timer allows the generator set to run without a load for a preset cooldown period.

CTGD Test

1. Close the circuit breaker for the normal power source.

The controller will illuminate the "NORMAL AVAILABLE" LED. The "NORMAL AVAILABLE" LED is illuminated in order to show that the normal power source is available.

2. Check the voltages at the terminals for the normal power source.

3. Close the circuit breaker for the emergency power source.

4. Start the generator set.

The controller will illuminate the "EMERGENCY AVAILABLE" LED. The "EMERGENCY AVAILABLE" LED is illuminated in order to show that the emergency power source is available.

5. Check the voltages at the terminals for the emergency power source.

6. Verify that the phase rotation of the emergency power source is equal to the phase rotation of the normal power source.

7. Shut down the generator set.

8. Put the generator set control in the automatic position.

9. Complete a visual inspection of the transfer switch.

10. Close and lock the cabinet door.

11. Initiate the test by pressing the "TEST" button on the keypad of the controller.

Press the test button and hold the test button until the switch transfers to the emergency power source. A delay timer delays the transfer from OPEN to EMERGENCY.

Note: Releasing the "TEST" button before the switch transfers to the emergency power source will terminate the test.

12. In order to start the transfer back to the normal power source, release the "TEST" button.

The transfer switch will complete the transfer back to the normal power source after the delay for the transfer to the normal power source has elapsed. A delay timer delays the transfer from OPEN to NORMAL. The engine cooldown timer allows the generator set to run without a load for a preset cooldown period.

Controller

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Engine Control Connections of the Controller

SMCS Code: 4469

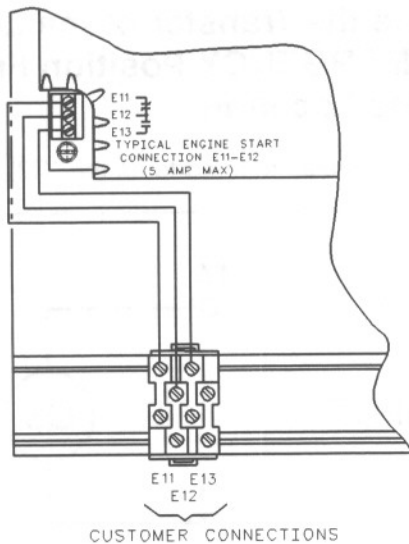


Illustration 21

g00828982

Connections for the engine control are located on the lower left side of the MX100. See illustration 21. Make all other necessary connections for control to the terminal blocks on the control panel per the schematics. See Schematic, RENR5853.

Note: All control wires (12 to 18 AWG) must be torqued to 2.15 N·m (19 lb in).

Output Option Connections of the Controller

SMCS Code: 4469

A6

This option is available on CTG units only. The option allows a load from a motor to be disconnected from the power source for a short period of time before a transfer between sources takes place. A load from a motor needs to be disconnected from a power source before the power is transferred to another source. Disconnecting the motor will ensure that the motor is not damaged. Damage to the motor can happen due to differences in the phase angles between the load and the new power source. The motors can be disconnected for an adjustable period of zero to sixty seconds prior to the transfer of the main contacts. This feature includes LED indicators that are used to indicate when the loads are disconnected.

T3/W3

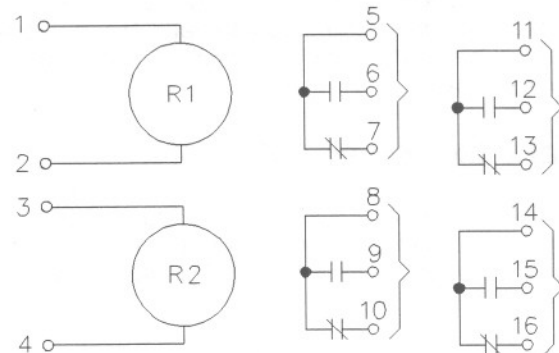


Illustration 22

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The T3/W3 option is not available on CTGD units.

The auxiliary contacts close up five seconds before the transfer in either direction and the contacts open after the transfer. The contacts are located on R1 and/or R2. Refer to the illustration 22.

Note: The pre-signal time is adjustable via the T3/W3 timers. See Service Information, "Timers".

T3 is prior to the transfer to NORMAL.

W3 is prior to the transfer to EMERGENCY.

The T3/W3 is terminated when the transfer is due to an outage of the power source.

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Input Option Connections of the Controller

SMCS Code: 4469

Maintained test switch “6A”

An auxiliary two-position maintained test switch is located on the cabinet door. This test switch is in addition to the standard test switch that is found on all MX100 controllers. When the auxiliary test switch is activated in the TEST position, the test will simulate a normal line failure. The transfer switch will automatically transfer the load to the EMERGENCY position. When the test switch is returned to the AUTOMATIC position, the transfer switch will restore the load to the NORMAL position. If the emergency power source fails in the EMERGENCY position, the ATS will transfer the load back to the normal power source immediately. If the normal power source is not available, the switch will remain in the EMERGENCY position.

Plant Exerciser “C”

This plant exerciser automatically starts the generator for selected time intervals. This exerciser runs the generator without a load. This test runs on a weekly basis.

Plant Exerciser “D”

This plant exerciser automatically starts the generator for selected time intervals. The exerciser runs the generator with a load. This test runs on a weekly basis.

Plant Exerciser “C/D”

This plant exerciser automatically starts the generator in order to run without a load, or the exerciser simulates a power failure. If the exerciser simulates a power failure, the exerciser runs the generator with a load. This test is run on a weekly basis.

Plant Exerciser “C/D-365”

This plant exerciser automatically starts the generator in order to run without a load, or the exerciser simulates a power failure. If the exerciser simulates a power failure, the exerciser runs the generator with a load. This test is done on a yearly basis.

Remote Peak Shave or Area Protection Circuit

This option is also referred to as the “Q2” option.

The “Q2” option provides a bypass for the immediate return to the normal power source if the emergency power source fails and the normal power source is available.

Disable the Transfer of the Load to the EMERGENCY Position From a Remote Location

This option is also referred to as the “Q3” option.

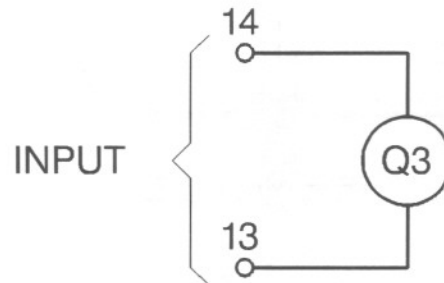


Illustration 23

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If a voltage is applied to the “Q3” input, the transfer switch will allow the load to be transferred to the emergency power source. No input on “Q3” will disable a transfer to the emergency power source.

Note: In order to enable the “Q3” option, engage the “Q3” jumper.

The “Q3” relay requires an input of 24 DCV.

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Communication Connections of the Controller

SMCS Code: 4469

Disclaimer

Caterpillar disclaims any and all liability for use of third-party application software that will be used to control the Automatic Transfer Switches.

! WARNING

Automatic Transfer Switches are often used in critical applications. Failure of an Automatic Transfer Switch to operate properly could cause property damage, personal injury or death. Extreme caution must be used when designing or using programming software that will communicate with the Automatic Transfer Switch. Improper use of the Modbus network variables will cause the Automatic Transfer Switch to malfunction. Always conduct a full test and debug of the programming software prior to installing and using it in the system.

ZNET100

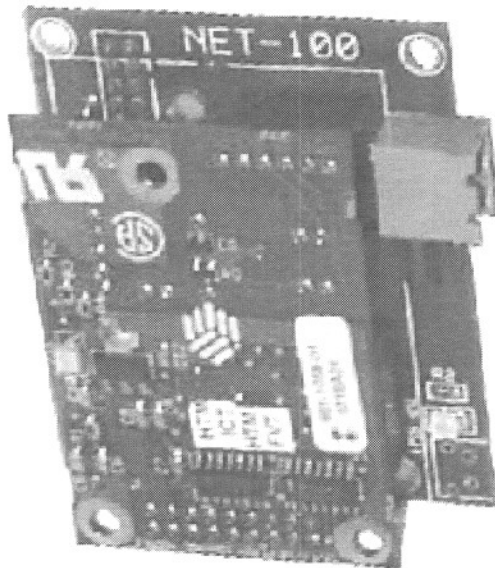


Illustration 24

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The ZNET100 network card enables the communication of the following information: the position of the transfer switch, the sources that are available, the timers that are running, and the test that is running. The information is sent to a remote annunciator panel, a PC, or a PLC via one pair of twisted wires. The wires should be 16 AWG. This cable is not included. The connections are located below the relay for the engine start timer.

Maintenance Section

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Maintenance Interval Schedule

SMCS Code: 4469

Before performing any operation or maintenance procedures, ensure that the Safety Information, warnings, and instructions are read and understood.

Every Year

Switch Contact - Inspect	21
Transfer Mechanism - Lubricate	21
Transfer Switch - Inspect	21
Transfer Switch - Test	23

i01579307

Switch Contact - Inspect

SMCS Code: 4469-040

DANGER

High voltage may be present. The power source must be disconnected before working on equipment. Failure to disconnect the power source could result in injury or death.

Do not perform any maintenance on the transfer switch until the system is locked out. In order to lock out the transfer switch, turn the "AUTO/INHIBIT" switch to the INHIBIT position. Then, put the external disconnect switch for the normal power source in the OFF position and lock out the disconnect switch. Then, put the external disconnect switch for the emergency power source in the OFF position, and lock out the disconnect switch.

Remove the barriers from the transfer switch and check the condition of the contacts. Any surface deposits must be removed with a clean dry cloth. **DO NOT USE AN EMERY CLOTH OR A FILE TO REMOVE DEPOSITS FROM THE CONTACTS.** If the contacts are pitted or the contacts are worn, the contacts should be replaced. A general inspection of the mechanical integrity should be made. Inspect the contacts for loose parts, broken parts, or badly worn parts. Replace any parts that are loose, broken, or worn. Inspect the discharge chutes for damage. Replace the discharge chutes if the discharge chutes are damaged.

After the following operations are performed on the transfer switch, reinstall the switch cover:

- Inspection
- Cleaning
- Servicing

Then close the cabinet door and lock the cabinet door. Close the circuit breaker that feeds the utility power service to the transfer switch and close the circuit breaker that feeds the generator power output to the transfer switch.

Once the maintenance is completed, the system can be energized. In order to energize the system, unlock the external disconnect switch for the normal power source. Put the disconnect switch in the ON position. Unlock the external disconnect switch for the emergency power source. Put the disconnect switch in the ON position. Finally, turn the "AUTO/INHIBIT" switch to the AUTO position.

i01579434

Transfer Mechanism - Lubricate

SMCS Code: 4469-086

DANGER

High voltage may be present. The power source must be disconnected before working on equipment. Failure to disconnect the power source could result in injury or death.

Do not perform any maintenance on the transfer switch until the system is locked out. In order to lock out the transfer switch, turn the "AUTO/INHIBIT" switch to the INHIBIT position. Then, put the external disconnect switch for the normal power source in the OFF position and lock out the disconnect switch. Then, put the external disconnect switch for the emergency power source in the OFF position, and lock out the disconnect switch.

The operating mechanisms of the transfer switch are lubricated with Lubriplate 105. The lubricant is applied at the factory. The mechanisms should be lubricated on a yearly basis. Also, if the mechanism becomes contaminated with debris, clean the mechanism with a clean dry cloth and apply additional Lubriplate 105.

Once the maintenance is completed, the system can be energized. In order to energize the system, unlock the external disconnect switch for the normal power source. Put the disconnect switch in the ON position. Unlock the external disconnect switch for the emergency power source. Put the disconnect switch in the ON position. Finally, turn the "AUTO/INHIBIT" switch to the AUTO position.

i01579276

Transfer Switch - Inspect

SMCS Code: 4469-040

DANGER

High voltage may be present. The power source must be disconnected before working on equipment. Failure to disconnect the power source could result in injury or death.

The inspection should not be started until the system is locked out. In order to lock out the transfer switch, turn the "AUTO/INHIBIT" switch to the INHIBIT position. Then, put the external disconnect switch for the normal power source in the OFF position and lock out the disconnect switch. Then, put the external disconnect switch for the emergency power source in the OFF position, and lock out the disconnect switch.

The transfer switch should be inspected and preventive maintenance should be performed on a yearly basis. The transfer switch should be inspected for any accumulation of dust, dirt, or moisture. The switch should be cleaned by a vacuum cleaner or by wiping the switch with a dry cloth or a soft brush. DO NOT use compressed air. The use of a vacuum is recommended.

Note: If compressed air is used, debris could lodge in the switch.

The Electrical connections should be inspected. The screw terminals for external power connections should be checked in order to make sure that the screws are tightened to the proper torque values. The proper torque values are shown in table 3. The lugs should be checked in order to make sure that the lugs are tightened to the proper torque values. The proper torque values are shown in table 4. If the unit has bus bars, the bus bars should be checked in order to make sure that the bolts are tightened to the proper torque values. The proper torque values are shown in table 5.

Table 3

Screw Terminals for External Power Connections				
Switch Size in Amp.	Normal, Emergency, and Load Terminals		Neutral Bar ⁽¹⁾	
	Cable Per Pole	Range of Wire Sizes	No. of Cables	Range of Wire Sizes
40	1	#8 to 1/0 AWG	3	#8 to 1/0 AWG
80	1	#8 to 1/0 AWG	3	#8 to 1/0 AWG
100	1	#8 to 1/0 AWG	3	#8 to 1/0 AWG
150	1	#8 to 3/0 AWG	3	#8 AWG to 300 MCM
200	1	#8 to 3/0 AWG	3	#8 AWG to 300 MCM
225, 250 ⁽²⁾	1	#6 AWG to 250 MCM	3	#6 AWG to 300 MCM
260, 300 ⁽²⁾ , 400	1	#4 AWG to 600 MCM	3	#4 AWG to 300 MCM
600	2	#2 AWG to 600 MCM	8	#2 AWG to 600 MCM
800 1000 1200	4	#2 AWG to 600 MCM	12	#2 AWG to 600 MCM
1600 2000 3000 4000	All of the terminals are located in the rear of the switch and the terminals are arranged for bus bar connections.			

⁽¹⁾ A Neutral Bar is not always required.

⁽²⁾ IEC Ratings Only

Table 4

Tightening Torque for Lugs		
Socket Size Across Flats	Torque	
	N-m (lb in)	lb ft
1/8	5.1 (45)	4
5/32	11.3 (100)	8
3/16	13.6 (120)	10
7/32	16.9 (150)	12
1/4	22.6 (200)	17
5/16	31.1 (275)	23
3/8	42.4 (375)	31
1/2	56.5 (500)	42
9/16	67.8 (600)	50

Table 5

Tightening Torque for Bus Bars		
Bolt Size	Bolt Torque (Grade 5)	
	N-m (lb in)	lb ft
1/4-20	8.1 (72)	6
5/16-18	14.9 (132)	11
3/8-16	33.9 (300)	25
1/2-13	81.3 (720)	60

The transfer switch should also be lubricated yearly using Lubriplate 105. For information about lubricating the switch, see Maintenance, "Transfer Mechanism - Lubricate".

Once the inspection is completed, the system can be energized. In order to energize the system, unlock the external disconnect switch for the normal power source. Put the disconnect switch in the ON position. Unlock the external disconnect switch for the emergency power source. Put the disconnect switch in the ON position. Finally, turn the "AUTO/INHIBIT" switch to the AUTO position.

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Transfer Switch - Test

SMCS Code: 4469-081

A manual operator handle is provided with the transfer switch. The manual operator handle is intended only to be used for maintenance. Manual operation of the switch must be checked before the switch is operated electrically. **Both power sources must be disconnected before manual operation of the switch.**

1. Insert the manual operator handle.
2. Operate the switch between the NORMAL and EMERGENCY positions.

The transfer switch should operate smoothly without binding.
3. Return the switch to the NORMAL position.
4. Remove the manual operator handle, and return the manual operator handle to the holder that is provided.
5. Close the cabinet door.
6. Close the circuit breaker for each power source.
7. Initiate the electrical transfer test by activating the "TS" test switch.

The engine start timer will time out and the controller will send an engine start signal. When the delay for the transfer to the emergency power source has elapsed, the switch will complete the transfer by closing into the emergency power source.

8. In order to start the transfer back to the normal power source, deactivate the "TS" test switch.

The transfer switch will complete the transfer back to the normal power source after the delay for the transfer to the normal power source has elapsed. The engine overrun timer allows the generator set to run without a load for a preset cool down period.

Service Information Section

Systems Operation

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Transfer Switch Operation

SMCS Code: 4469

The timers in the following list are represented on the controller by the corresponding letter code.

“P” – Engine start timer

“W” – Delay to emergency timer

“T” – Delay to normal timer

“U” – Engine cooldown timer

“DW” – Delay timer from open to emergency

“DT” – Delay timer from open to normal

The relays that operate the transfer switch are represented by the following letter codes: “CCE”, “CCN”, “CCEO”, and “CCNO”. The solenoids that operate the transfer switch are represented by the following letter codes: “CE”, “CN”, “CEO”, and “CNO”. The limit switches that operate the transfer switch are represented by the following letter codes: “SE” and “SN”. The letter codes are used on the parts and the letter codes are used on the circuit diagrams.

The transfer of the load to the emergency power source begins automatically when any phase of the normal power source falls below the preset dropout voltage level, and the undervoltage condition is detected by the MX100 microprocessor. The engine start timer begins. The engine start timer delay is provided in order to override outages that are only momentary. If the voltage of the normal power source returns to a value above the pickup voltage, the engine start timer cycle is reset. The transfer of power is stopped.

If the engine start timer has completed the cycle, and the voltage of the normal power source has not returned to the normal range. Then, the controller sends an engine start signal to the generator set. The microprocessor senses the voltage and the frequency of the emergency power source. When the voltage and the frequency of the emergency power source reach the preset values, the delay timer for the emergency power source begins the delay. The delay timer for the emergency power source provides a delay that is adjustable for the transfer to the emergency power source.

The transfer to the emergency power source is then completed in the following manner.

CTG Models

For the CTG models, the ATS transfers the load to the emergency position. Power is delivered to the load by the generator. If the “A6” or “T3/W3” options are installed on the unit, a presignal is initiated prior to the transfer of power. Then, the “TA6” timer starts. After the “TA6” timer is completed, the ATS transfers the load to the emergency position.

Once the delay to emergency timer is finished, the “CCE” relay will energize the “CE” solenoid in order to transfer the load to the emergency power source. The “SE” limit switch then activates in order to de-energize the “CCE” relay.

The transfer to the normal position begins when the voltage of all phases of the normal power source have reached the pickup value.

When the normal power source is restored, the transfer to the normal power source is initiated by energizing the delay timer for the normal power source. The delay timer for the normal power source provides an adjustable delay in order to ensure that the normal power source has stabilized before the reconnection to the load. If the normal power source should fail before the completion of the delay timer for the normal power source, the transfer of the load to the normal power source will be stopped.

For the CTG models, the ATS transfers the load to the normal position. Power is delivered to the load by the utility. If the “A6” or “T3/W3” options are installed on the unit, a presignal is initiated prior to the transfer of power. Then, the “TA6” timer starts. After the “TA6” timer is completed, the ATS transfers the load to the normal position.

When the delay to normal timer is finished, the "CCN" relay energizes the "CN" solenoid in order to transfer the load to the normal power source. The "SN" limit switch will activate in order to de-energize the "CCN" relay. Simultaneously, the engine cooldown timer begins. The engine cooldown timer provides a period of time for the generator set to run without a load in order to cool down before shutdown.

CTGD Models

For CTGD models, the "CCNO" relay energizes the "CNO" solenoid in order to open the ATS out of normal to the open position. The delay timer from open to emergency begins. Once the timer has completed the cycle, the "CCE" relay energizes. The switch then completes the transfer to the emergency power source by energizing the "CE" solenoid. The "SE" limit switch activates in order to de-energize the "CCE" relay.

When the normal power source is restored, the transfer to the normal power source is initiated by energizing the delay timer for the normal power source. The delay timer for the normal power source provides an adjustable delay in order to ensure that the normal power source has stabilized before the reconnection to the load. If the normal power source should fail before the completion of the delay timer for the normal power source, the transfer of the load to the normal power source will be stopped.

When the delay to normal timer is finished, the "CCEO" relay energizes the "CEO" solenoid in order to open the ATS out of emergency to the open position. The delay timer from open to normal begins. Once the timer has completed the cycle, the "CCN" relay energizes. The switch then completes the transfer to the emergency power source by energizing the "CN" solenoid. The "SN" limit switch activates in order to de-energize the "CCN" relay. Simultaneously, the engine cooldown timer begins. The engine cooldown timer provides a period of time for the generator set to run without a load in order to cool down before shutdown.

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Power Failure Operation

SMCS Code: 4469

When the normal power source is available and the transfer switch is in the NORMAL position, the "NORMAL POSITION" LED will be illuminated and the "NORMAL AVAILABLE" LED will be illuminated.

Failure of the Normal Power Source

When the voltage of the normal power source falls below the preset dropout voltage, the engine start timer begins. The factory setting for the engine start timer is three seconds. None of the LED indicators will be illuminated. If the voltage of the normal power source remains below the dropout value throughout the cycle of the engine start timer, a signal will be sent in order to start the generator. The "NORMAL POSITION" LED and the "EMERGENCY AVAILABLE" LED will be illuminated. The MX100 controller will then monitor the voltage of the generator and the frequency of the generator. When the voltage and frequency of the generator reach acceptable levels, the delay to EMERGENCY timer begins. The "DELAY TO EMERGENCY" LED will be illuminated.

When the delay to EMERGENCY timer completes the cycle, the "DELAY TO EMERGENCY" LED will no longer be illuminated. The transfer to the emergency power source is then completed in the following manner.

For the CTG models, the ATS transfers the load to the EMERGENCY position. Power is delivered to the load by the generator. The "EMERGENCY POSITION" LED will become illuminated and the "NORMAL POSITION" LED will no longer be illuminated. If the A6 or T3/W3 options are installed on the unit, a presignal is initiated. Then, the TA6 timer starts. The "PRESIGNAL ON" LED and the "PRESIGNAL TIME DELAY TO EMERGENCY" LED will be illuminated. After the TA6 timer is completed, the ATS transfers the load to the EMERGENCY position. The "EMERGENCY POSITION" LED will become illuminated and the "NORMAL POSITION" LED will no longer be illuminated. Also, the "PRESIGNAL TIME DELAY TO EMERGENCY" LED and the "PRESIGNAL ON" LED will no longer be illuminated.

For CTGD models, the ATS opens out of NORMAL to the open position. The "OPEN POSITION" LED will become illuminated and the "NORMAL POSITION" LED will no longer be illuminated. The delay timer from open to EMERGENCY begins. The "DELAY TO OPEN EMERGENCY" LED will become illuminated. Once the timer has completed the cycle, the switch transfers the load to the EMERGENCY position. The "EMERGENCY POSITION" LED will become illuminated and the "OPEN POSITION" LED will no longer be illuminated. Also, the "DELAY TO OPEN EMERGENCY" LED will no longer be illuminated.

Restoration of the Normal Power Source

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When the voltage and frequency of the normal power source reach the respective pickup values, the delay to NORMAL timer begins. The "DELAY TO NORMAL" LED will become illuminated. If the voltage of the normal power source remains above the pickup value for the duration of the delay to NORMAL timer, the transfer to NORMAL is accomplished. The "NORMAL AVAILABLE" LED will become illuminated and the "DELAY TO NORMAL" LED will no longer be illuminated.

For the CTG models, the ATS transfers the load to the NORMAL position. The "NORMAL POSITION" LED will be illuminated and the "EMERGENCY POSITION" LED will no longer be illuminated. Power is delivered to the load by the utility. If the A6 or T3/W3 options are installed on the unit, a presignal is initiated. The "PRESIGNAL ON" LED will become illuminated. Then, the TA6 timer starts. The "PRESIGNAL TIME DELAY TO NORMAL" LED will become illuminated. After the TA6 timer is completed, the ATS transfers the load to the NORMAL position. The "PRESIGNAL ON" LED and the "PRESIGNAL TIME DELAY TO NORMAL" LED will no longer be illuminated. The "NORMAL POSITION" LED will become illuminated and the "EMERGENCY POSITION" LED will no longer be illuminated.

For CTGD models, the ATS opens out of EMERGENCY to the open position. The "OPEN POSITION" LED will become illuminated and the "EMERGENCY POSITION" LED will no longer be illuminated. The delay timer from open to NORMAL begins. The "DELAY TO OPEN NORMAL" LED will become illuminated. Once the timer has completed the cycle, the switch transfers the load to the NORMAL position. The "DELAY TO OPEN NORMAL" LED will no longer be illuminated. The "NORMAL POSITION" LED will become illuminated and the "EMERGENCY POSITION" LED will no longer be illuminated.

The engine cooldown timer begins. The "DELAY ENGINE STOP" LED will become illuminated and the "EMERGENCY AVAILABLE" LED will no longer be illuminated. When the engine cooldown timer completes the cycle, the engine will shut down. The "DELAY ENGINE STOP" LED will no longer be illuminated.

Exerciser

SMCS Code: 4469

The MX100 controller is equipped with a built-in seven day exerciser. Pressing the "initiate" switch will start a timer that will continue for 167 hours and 40 minutes. An LED will illuminate in order to indicate that the timer has started. After 167 hours and 40 minutes, a load test or a no-load test occurs. The test is determined by the location of the jumper on the PC board of the controller.

TSL – load

TSNL – no load

The test lasts for 20 minutes. The LED for the "CDT" exerciser will flash when the test is in progress. This test does not include the delay to normal timer, or the engine cooldown timer. The test can be disabled by pressing the "disable/enable" switch. When the "disable/enable" switch is pressed, the NEXT test will not occur, but the timer will not be affected. After one week, the following test will start normally. The LED for the "CDT" exerciser will turn off when the "disable/enable" switch is pressed for the first time after initiating the timer. Pressing the "disable/enable" switch will re-enable the event. The LED for the "CDT" exerciser will turn on. The time of the event can be changed by initiating the event again. When the switch is pressed, the timer begins. The timer runs for 167 hours and 40 minutes. When you press the switch, the time is set. The next test will now start at 20 minutes before this time in one week (167 hours 40 minutes).

Note: In order to avoid inadvertent initiating of the test, the button should be held down for three seconds when the button is pressed. In order to avoid inadvertent disabling of the test, the button should be held down for three seconds when the button is pressed.

Note: A nine volt battery is supplied with the ATS in order to prevent the exercise timer from losing the "set exercise time" in the event of an outage of power. The battery can provide backup power to the processor for eight hours. If the battery has supplied power to the microprocessor for an extended amount of time, the battery should be replaced.

Note: The nine volt battery cannot be plugged into a PC board that is de-energized. The PC board includes large capacitors that cannot be charged by the battery. If the capacitors are charged, the battery will discharge eventually due to the load of the PC board. Therefore, do not install a battery until the PC board is energized. The battery will be able to maintain the "CDT "set exercise time"" in the event of an outage.

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Timers

SMCS Code: 4469

Engine Start Timer

The engine start timer is also referred to as the "P" timer.

The engine start timer is used to ensure that the transfer switch does not start the engine during momentary outages. The time range is zero to ten seconds. The timer begins when the normal power source fails to meet the adjusted parameters. When the timer has elapsed, the contacts of the engine start relay will operate in order to start the engine. The engine start timer can be adjusted by using the "P(SEC)" dial on the back of the controller. The factory default setting is three seconds.

Delay to Emergency Timer

The delay to emergency timer is also referred to as the "W" timer.

This timer is used to ensure that the generator is stable before the transfer occurs. The time range is zero to fifteen seconds. The timer begins once the output of the generator satisfies the adjusted parameters. When the timer has elapsed, the transfer to the emergency power source will be initiated. The transfer to emergency timer can be adjusted by using the "W(SEC)" dial on the back of the controller. The factory default setting is one second.

The ATS is not dedicated to the transfer to the emergency power source. If the voltage of the normal power source is restored before the completion of the transfer to emergency timer, the ATS will remain in the normal position. The engine cooldown timer will be initiated.

Delay to Normal Timer

The delay to normal timer is also referred to as the "T" timer.

This timer is used to verify that the normal power source has consistently met the parameters of the sensors for a minimum amount of time. The time range is zero to thirty minutes. The timer begins when the normal power source satisfies the parameters of the sensors. When the timer has elapsed, the transfer to the normal power source will be initiated. The transfer to normal timer can be adjusted by using the "T(MIN)" dial on the back of the controller. The factory default setting is thirty minutes.

Engine Cooldown Timer

The engine cooldown timer is also referred to as the "U" timer.

This timer is used in order to run the generator without a load before the engine is stopped. The time range is zero to five minutes. The timer will start after the switch transfers to the normal power source. When the timer has elapsed, the engine start relay will operate in order to stop the engine. The engine cooldown timer can be adjusted by using the "U(MIN)" dial on the back of the controller. The factory default setting is five minutes.

Open Delay Timers

The delay from open to normal timer is also referred to as the "DT" timer. The delay from open to emergency timer is also referred to as the "DW" timer.

The open delay timers are only present on CTGD models. These timers are used to control the center open position of delay transfer switches in order to allow the back EMF of the load to discharge before re-energizing the load. These timers have a range of zero to thirty seconds.

The "DT" timer controls the time of the transfer while the switch is open during the transfer from the emergency power source to the normal power source. The "DT" timer can be adjusted by using the "DT(SEC)" dial on the back of the controller. The "DW" timer controls the time of the transfer while the switch is open during the transfer from the normal power source to the emergency power source. The "DW" timer can be adjusted by using the "DW(SEC)" dial on the back of the controller. The factory default setting for both timers is five seconds.

Optional Pre-signal Timers

The pre-signal timers are not available on CTGD units.

These timers are used to provide an output prior to the transfer. These outputs are provided in order to coordinate systems for the interruption that will occur while the transfer takes place. These timers have a range of zero to sixty seconds. The time ranges are adjustable in one second increments. The "T3" timer takes place prior to the transfer to the normal power source, and the "W3" timer takes place prior to the transfer to the emergency power source. Output of these timers are usually used in conjunction with elevators. Output of these timers are also used in conjunction with a UPS.

The "A6" option uses the "TA5" timer and the "TA6" timer. The "A6" option allows loads from motors to be disconnected prior to the transfer of power. See Installation, "Output Option Connections of the Controller".

The "TA5" timer will provide a pre-signal for the contacts. The pre-signal is used when the switch transfers the load from the emergency position to the normal position. This option is configured without a feature that will bypass a dead source. The bypass is utilized on the standard "T3/W3" model.

The "TA6" timer will provide a pre-signal for the contacts. The pre-signal is used when the switch transfers the load from the normal position to the emergency position. This option is configured without a feature that will bypass a dead source. The bypass is utilized on the standard "T3/W3" model.

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Sensors

SMCS Code: 4469-NS

Normal Pickup Voltage

This adjustment determines the minimum voltage that is required in order to transfer the switch to NORMAL. The range of this setting is 85 to 100 percent. Once the normal power source goes above the pickup voltage, the transfer to NORMAL timer begins. This sensor can be adjusted via the "VOLTAGE %" dial that is marked "PICK UP" in the row of dials that is marked "N" on the back of the controller. The factory default setting is ninety percent.

Normal Pickup Frequency

This adjustment determines the minimum frequency that is required in order to transfer the switch to NORMAL. The range of this setting is 90 to 100 percent. Once the normal power source goes above the pickup frequency, the transfer to NORMAL timer begins. This sensor can be adjusted via the "FREQUENCY %" dial that is marked "PICK UP" in the row of dials that is marked "N" on the back of the controller. The factory default setting is ninety percent.

Normal Dropout Voltage

This adjustment determines the low voltage threshold. The range of this setting is 75 to 98 percent. The dropout voltage must be a minimum of 2 percent below the pickup voltage. Once the voltage falls below the threshold, the engine start timer begins. This sensor can be adjusted via the "VOLTAGE %" dial that is marked "DROP OUT" in the row of dials that is marked "N" on the back of the controller. The factory default setting is eighty percent.

Emergency Pickup Voltage

This adjustment determines the minimum voltage that is required in order to transfer the switch to EMERGENCY. The range of this setting is 85 to 100 percent. Once the emergency power source goes above the pickup voltage, the transfer to EMERGENCY timer begins. This sensor can be adjusted via the "VOLTAGE %" dial that is marked "PICK UP" in the row of dials that is marked "E" on the back of the controller. The factory default setting is ninety percent.

Emergency Pickup Frequency

This adjustment determines the minimum frequency that is required in order to transfer the switch to EMERGENCY. The range of this setting is 90 to 100 percent. Once the emergency power source goes above the pickup frequency, the transfer to EMERGENCY timer begins. This sensor can be adjusted via the "FREQUENCY %" dial that is marked "PICK UP" in the row of dials that is marked "E" on the back of the controller. The factory default setting is 95 percent.

Emergency Dropout Voltage

This adjustment determines the low voltage threshold. The range of this setting is 75 to 98 percent. The dropout voltage must be a minimum of 2 percent below the pickup voltage. Once the voltage falls below the threshold, the transfer to NORMAL timer is bypassed in order to transfer the load to the normal power source. This sensor can be adjusted via the "VOLTAGE %" dial that is marked "DROP OUT" in the row of dials that is marked "E" on the back of the controller. The factory default setting is eighty percent.

Troubleshooting

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Troubleshooting

SMCS Code: 4469-035

General Troubleshooting

The Engine Does Not Start

1. Check if the engine control switch is in the OFF position.

Expected Result: The engine control switch is turned OFF.

Results:

OK – The generator is in the OFF position. Turn the switch to the ON position or turn the switch to the AUTO position. STOP.

NOT OK – The generator is not in the OFF position. Proceed to step 2.

2. Check the engine start contacts.

Expected Result: The wires are not terminated properly.

Results:

OK – The wires are not terminated properly. Fix the wires. STOP.

NOT OK – The wires are terminated properly. The circuitry of the ATS is correct. See the service manual for the generator.

The Engine Does Not Stop

1. Check the LCD.

Expected Results: "DELAY TO ENGINE STOP" is displayed on the LCD.

Results:

OK – The engine cooldown timer is not complete. Wait for the timer. STOP.

NOT OK – The engine cooldown timer is complete. Proceed to step 2.

2. Check the engine start contacts.

Expected Results: The wires are not terminated properly.

Results:

OK – The wires are not terminated properly. Fix the wires. STOP.

NOT OK – The wires are terminated properly. Proceed to step 3.

3. Check if the engine control switch of the generator is in the MANUAL position.

Expected Results: The engine control switch of the generator is in the MANUAL position.

Results:

OK – The generator is in the MANUAL position. Put the generator in the AUTO position. STOP.

NOT OK – The generator is not in the MANUAL position. See the service manual for the generator.

The ATS Will Not Transfer The Load To The Emergency Power Source.

1. Check the connector for the power supply.

Expected Results: The connector for the power supply is unplugged.

Results:

OK – The connector for the power supply is unplugged. Plug in the connector. STOP.

NOT OK – The connector for the power supply is plugged in. Go to step 2.

2. Check the LED indicators.

- a. Check if the LED indicators are flashing.

Expected Results: The "NORMAL POSITION" LED and the "EMERGENCY POSITION" LED are flashing.

Results:

OK – The "NORMAL POSITION" LED and the "EMERGENCY POSITION" LED are flashing. The connector for the limit switches is unplugged or the connector for the R/T box is unplugged. Plug in the connector. STOP.

NOT OK – The "NORMAL POSITION" LED and the "EMERGENCY POSITION" LED are NOT flashing. Proceed to step 2.b.

- b. Check if the "EMERGENCY AVAILABLE" LED is illuminated.

Expected Results: The "EMERGENCY AVAILABLE" LED is NOT illuminated.

Results:

OK – The "EMERGENCY AVAILABLE" LED is NOT illuminated. The voltage of the emergency power source is not within the defined setting, or the frequency of the emergency power source is not within the defined setting. Check the following items: the connections at the engine start contacts, the breaker for the generator, the generator output, and the engine control switch. STOP.

NOT OK – The "EMERGENCY AVAILABLE" LED is illuminated. Go to step 2.c.

- c. Check if "DELAY TO OPEN NORMAL" LED is illuminated.

Expected Results: "DELAY TO OPEN NORMAL" LED is illuminated.

Results:

OK – "DELAY TO OPEN NORMAL" LED is illuminated. Wait for the timer. STOP.

NOT OK – "DELAY TO OPEN NORMAL" LED is not illuminated. See the Troubleshooting manual for the generator.

The ATS Will Not Transfer The Load To The Normal Power Source.

1. Check the connector for the power supply.

Expected Results: The connector for the power supply is unplugged.

Results:

OK – The connector for the power supply is unplugged. Plug in the connector. STOP.

NOT OK – The connector for the power supply is plugged in. Go to step 2.

2. Check the LED indicators.

- a. Check if the LED indicators are flashing.

Expected Results: The "NORMAL POSITION" LED and the "EMERGENCY POSITION" LED are flashing.

Results:

OK – The "NORMAL POSITION" LED and the "EMERGENCY POSITION" LED are flashing. The connector for the limit switches is unplugged or the connector for the R/T box is unplugged. Plug in the connector. STOP.

NOT OK – The "NORMAL POSITION" LED and the "EMERGENCY POSITION" LED are NOT flashing. Proceed to step 2.b.

- b. Check if the "NORMAL AVAILABLE" LED is illuminated.

Expected Results: The "NORMAL AVAILABLE" LED is NOT illuminated.

Results:

OK – The "NORMAL AVAILABLE" LED is NOT illuminated. The voltage of the emergency power source is not within the defined setting, or the frequency of the emergency power source is not within the defined setting. Check the following items: the connections at the engine start contacts, the breaker for the generator, the generator output, and the engine control switch. STOP.

NOT OK – The "NORMAL AVAILABLE" LED is illuminated. Go to step 2.c.

- c. Check if "DELAY TO OPEN EMERGENCY" LED is illuminated.

Expected Results: "DELAY TO OPEN EMERGENCY" LED is illuminated.

Results:

OK – "DELAY TO OPEN EMERGENCY" LED is illuminated. Wait for the timer. STOP.

NOT OK – "DELAY TO OPEN EMERGENCY" LED is not illuminated. See the Troubleshooting manual for the generator.

Improper Annunciation of the LED Indicators

1. Check the LED indicators.

Expected Results: None of the "AVAILABLE" LED indicators illuminate and the "POSITION" indicators illuminate.

Results:

OK – None of the “AVAILABLE” LED indicators illuminate and the “POSITION” indicators illuminate. The MX200 PC board may be configured for the wrong frequency. Verify the voltage and the frequency of the source. STOP.

NOT OK – The “AVAILABLE” LED indicators illuminate. Go to step 2.

2. Check the LED indicators.

Expected Results: The “NORMAL AVAILABLE” LED and the “EMERGENCY AVAILABLE” LED are illuminated when the frequency is below the preset pickup value.

Results:

OK – The “NORMAL AVAILABLE” LED and the “EMERGENCY AVAILABLE” LED are illuminated when the frequency is below the preset pickup value. The MX200 PC board may be configured for the wrong frequency. Verify the voltage and the frequency of the source. STOP

NOT OK – The “NORMAL AVAILABLE” LED and the “EMERGENCY AVAILABLE” LED are NOT illuminated when the frequency is below the preset pickup value. Contact your Caterpillar Dealer. STOP.

Diagnostic Annunciation

The MX100 controller incorporates diagnostics in order to help with troubleshooting. The annunciations are flashing LED indicators.

CTG Units

The “NORMAL POSITION” LED is flashing and the ATS Will Not Transfer the Switch Out of the Normal Position

1. Check the solenoid circuit.

Expected Results: There is a problem with the solenoid circuit.

Results:

OK – There is a visible problem with the solenoid circuit. Repair the circuit. STOP.

NOT OK – There is not a visible problem with the solenoid circuit. Contact your Caterpillar Dealer. STOP

The “EMERGENCY POSITION” LED is flashing and the ATS Will Not Transfer the Switch Out of the Emergency Position

1. Check the solenoid circuit.

Expected Results: There is a problem with the solenoid circuit.

Results:

OK – There is a visible problem with the solenoid circuit. Repair the circuit. STOP.

NOT OK – There is not a visible problem with the solenoid circuit. Contact your Caterpillar Dealer. STOP

The “NORMAL POSITION” LED and the “EMERGENCY POSITION” LED Are Both Flashing

1. Check the plugs for the limit switches.

Expected Results: The plugs for the limit switches are not connected to the MX100 controller.

Results:

OK – The plugs are not connected to the controller. Connect the plugs to the controller. STOP.

NOT OK – The plugs are connected to the controller. The limit switches are not within adjustment. Contact your Caterpillar Dealer. STOP

CTG Units with the A6 Option

The “NORMAL POSITION” LED is flashing and the ATS Will Not Transfer the Switch Out of the Normal Position

1. Check the connections to the RA6 relay.

Expected Results: The RA6 relay is not latching.

Results:

OK – The RA6 relay is not latching. Fix the connections to the relay. STOP.

NOT OK – The RA6 relay is latching. Replace the Relay. STOP

The “EMERGENCY POSITION” LED is flashing and the ATS Will Not Transfer the Switch Out of the Emergency Position

1. Check the connections to the RA6 relay.

Expected Results: The RA6 relay is not latching.

Results:

OK – The RA6 relay is not latching. Fix the connections to the relay. STOP.

NOT OK – The RA6 relay is latching. Replace the Relay. STOP

The “PRESIGNAL ON” LED is flashing and the ATS will not transfer the switch after the load of the motor is disconnected

1. Check the solenoid circuit.

Expected Results: There is a problem with the solenoid circuit.

Results:

OK – There is a visible problem with the solenoid circuit. Repair the circuit. STOP.

NOT OK – There is not a visible problem with the solenoid circuit. Contact your Caterpillar Dealer. STOP.

The “NORMAL POSITION” LED and the “PRESIGNAL ON” LED Are Both Flashing

1. Check the contacts for the limit switches.

Expected Results: The limit switches are not registered as closed contacts, or the RA6 contact is not registered as a closed contact.

Results:

OK – The limit switches are not registered as closed contacts. Contact your Caterpillar Dealer. STOP.

NOT OK – The limit switches are registered as closed contacts. Contact your Caterpillar Dealer. STOP.

The “EMERGENCY POSITION” LED and the “PRESIGNAL ON” LED Are Both Flashing

1. Check the contacts for the limit switches.

Expected Results: The limit switches are not registered as closed contacts, or the RA6 contact is not registered as a closed contact.

Results:

OK – The limit switches are not registered as closed contacts. Contact your Caterpillar Dealer. STOP.

NOT OK – The limit switches are registered as closed contacts. Contact your Caterpillar Dealer. STOP.

The “NORMAL POSITION” LED and the “EMERGENCY POSITION” LED Are Both Flashing

1. Check the plugs for the limit switches.

Expected Results: The plugs for the limit switches are not connected to the MX100 controller.

Results:

OK – The plugs are not connected to the controller. Connect the plugs to the controller. STOP.

NOT OK – The plugs are connected to the controller. The limit switches are not within adjustment. Proceed to step 2.

2. Check the contacts for the limit switches.

Expected Results: The limit switches are not registered as closed contacts, or the RA6 contact is not registered as a closed contact.

Results:

OK – The limit switches are not registered as closed contacts. Contact your Caterpillar Dealer. STOP.

NOT OK – The limit switches are registered as closed contacts. Contact your Caterpillar Dealer. STOP.

CTGD Units

The “NORMAL POSITION” LED is flashing and the ATS Will Not Transfer the Switch Out of the Normal Position

1. Check the solenoid circuit.

Expected Results: There is a problem with the solenoid circuit.

Results:

OK – There is a visible problem with the solenoid circuit. Repair the circuit. STOP.

NOT OK – There is not a visible problem with the solenoid circuit. Contact your Caterpillar Dealer. STOP.

The “EMERGENCY POSITION” LED is flashing and the ATS Will Not Transfer the Switch Out of the Emergency Position

1. Check the solenoid circuit.

Expected Results: There is a problem with the solenoid circuit.

Results:

OK – There is a visible problem with the solenoid circuit. Repair the circuit. STOP.

NOT OK – There is not a visible problem with the solenoid circuit. Contact your Caterpillar Dealer. STOP.

The “OPEN POSITION” LED is flashing and the ATS Will Not Transfer the Switch Out of the Open Position

1. Check the solenoid circuit.

Expected Results: There is a problem with the solenoid circuit.

Results:

OK – There is a visible problem with the solenoid circuit. Repair the circuit. STOP.

NOT OK – There is not a visible problem with the solenoid circuit. Contact your Caterpillar Dealer. STOP.

The “NORMAL POSITION” LED and the “OPEN POSITION” LED Are Both Flashing

1. Check the contacts for the limit switches.

Expected Results: The limit switches are not registered as closed contacts, or the RA6 contact is not registered as a closed contact.

Results:

OK – The limit switches are not registered as closed contacts. Contact your Caterpillar Dealer. STOP.

NOT OK – The limit switches are registered as closed contacts. Contact your Caterpillar Dealer. STOP.

The “EMERGENCY POSITION” LED and the “OPEN POSITION” LED Are Both Flashing

1. Check the contacts for the limit switches.

Expected Results: The limit switches are not registered as closed contacts, or the RA6 contact is not registered as a closed contact.

Results:

OK – The limit switches are not registered as closed contacts. Contact your Caterpillar Dealer. STOP.

NOT OK – The limit switches are registered as closed contacts. Contact your Caterpillar Dealer. STOP.

The “NORMAL POSITION” LED, the “OPEN POSITION” LED, and the “EMERGENCY POSITION” LED Are All Flashing

1. Check the plugs for the limit switches.

Expected Results: The plugs for the limit switches are not connected to the MX100 controller.

Results:

OK – The plugs are not connected to the controller. Connect the plugs to the controller. STOP.

NOT OK – The plugs are connected to the controller. The limit switches are not within adjustment. Proceed to step 2.

2. Check the contacts for the limit switches.

Expected Results: The limit switches are not registered as closed contacts, or the RA6 contact is not registered as a closed contact.

Results:

OK – The limit switches are not registered as closed contacts. Contact your Caterpillar Dealer.
STOP.

NOT OK – The limit switches are registered as closed contacts. Contact your Caterpillar Dealer.
STOP.

Reference Information Section

Reference Materials

i01622407

Reference Material

SMCS Code: 4469

The following literature can be obtained through any Caterpillar dealer.

Schematics

Schematic, RENR5853, "CTG and CTGD Automatic Transfer Switches (ATS) Electrical System".

Parts Books

Parts Book, SEBP3558, "Automatic Transfer Switches CTG, CTGD Series".

Additional literature may have become available. This literature may not be included above. Before ordering any literature, contact a Caterpillar dealer. Ask the Caterpillar dealer to check on the following items: availability of the literature, form number of the literature, and price of the literature.

Index

C

Communication Connections of the Controller	18
Disclaimer	18
ZNET100.....	19
Control Connections of the Transfer Switch.....	13
Controller.....	17

E

Electrical System.....	7
Grounding Practices	7
Engine Control Connections of the Controller	17
Exerciser.....	26

F

Final Inspection of the Transfer Switch.....	14
Foreword.....	4
Literature Information.....	4
Maintenance	4
Operation	4
Safety	4
Functional Test of the Transfer Switch	14
CTG Test.....	15
CTGD Test	16
Initial Start-Up.....	14

G

General Hazard Information	6
General Information.....	9
Controller	9
Transfer Switch	9

I

Important Safety Information	2
Information Plate	9
Serial Number Plate.....	9
Input Option Connections of the Controller	18
Disable the Transfer of the Load to the EMERGENCY Position From a Remote Location.....	18
Maintained test switch "6A"	18
Plant Exerciser "C"	18
Plant Exerciser "C/D"	18
Plant Exerciser "C/D-365"	18
Plant Exerciser "D"	18
Remote Peak Shave or Area Protection Circuit..	18
Installation Information	7
Installation Section	12

M

Maintenance Interval Schedule	20
Maintenance Section	20
Model View Illustrations	8
CTG/CTGD	8
Model Views	8
Mounting.....	12

O

Output Option Connections of the Controller.....	17
A6.....	17
T3/W3	17

P

Power Connections of the Transfer Switch	12
Power Failure Operation	25
Failure of the Normal Power Source	25
Restoration of the Normal Power Source.....	26
Product Identification Information	9
Product Information Section	8

R

Receiving Inspection and Storage.....	12
Reference Information Section	36
Reference Material	36
Parts Books.....	36
Schematics	36
Reference Materials	36

S

Safety Section	5
Safety Signs and Labels.....	5
Sensors	28
Emergency Dropout Voltage	29
Emergency Pickup Frequency	28
Emergency Pickup Voltage	28
Normal Dropout Voltage.....	28
Normal Pickup Frequency.....	28
Normal Pickup Voltage.....	28
Service Information Section	24
Switch Contact - Inspect.....	21
Systems Operation	24

T

Table of Contents.....	3
------------------------	---

Timers.....	27
Delay to Emergency Timer	27
Delay to Normal Timer	27
Engine Cooldown Timer.....	27
Engine Start Timer.....	27
Open Delay Timers	27
Optional Pre-signal Timers	27
Transfer Mechanism - Lubricate	21
Transfer Switch	12
Transfer Switch - Inspect	21
Transfer Switch - Test	23
Transfer Switch Operation	24
CTG Models.....	24
CTGD Models	25
Troubleshooting	30
CTG Units	32
CTG Units with the A6 Option.....	32
CTGD Units.....	34
Diagnostic Annunciation	32
General Troubleshooting.....	30
Improper Annunciation of the LED Indicators	31