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GC 300 TEST PROCEDURE

FORM NO. L-21172-B-0605

GC300 Test Procedure
L-21172-A-0803

REQUIRED EQUIPMENT:

- Digital Volt Meter (DVM)
- Adjustable power supply capable of 5 VDC
- GC300 Power Board Tester
- Small standard screw driver
- Edge sensor (UH21/20 or PH16/46)
- Proximity sensor (same as Nexen uses for auto-center switch)
  Pepperl & Fuchs PT# NJ4-12GK-N crastin model
- Device programmer (for AT29C512)
- 4ohm, 100W minimum, 1%, Resistor
- 2 Kohm, 5%, one turn Potentiometer
- 24 VDC linear actuator with limits or the limits could be simulated with manually operated switches.
- SPDT center off (**normally closed contacts**) switch for auto-center simulation
- Second Sensor Board (to connect to J3 on the control board)
- Ambient air temperature during the test should be between 16C and 32C (60.8F and 89.6F)

VISUAL INSPECTION

Inspect all boards for solder bridges, wrong components, backwards components etc.

POWER BOARD TESTS

The power board is tested by itself for this part of the test.

1.0 Connect adjustable power supply to **5V** terminals on GC300 Power Board Tester (observe terminal's polarity).

2.0 Connect DVM's negative lead to **Black VM** terminal of tester.

3.0 Mount GC300 Power Board to tester utilizing the mounting standoffs.

4.0 Connect tester's P1 ribbon cable plug to J1 on power board.

5.0 Connect tester's P2 4 ohm resistor to J2-1 and J2-2 terminals on power board.

5.1 Connect Red and Black wires from P2 to **Output** test points on tester (observe terminal's polarity).

6.0 Connect VAC power cord to control board's J3 terminals as follows:

J3-1	120VAC, black
J3-2	Neutral, white
J3-3	Earth Ground, green

7.0 Connect power transformer to power board's J4 terminals for 120 VAC operation as follows:

J4-1 Blue & Violet Wires
J4-4 Brown & Gray Wires
J4-5 Black Wire
J4-6 Red Wire
J4-7 Orange Wire
J4-8 Yellow Wire

8.0 Turn on the power supply and set output to 4 VDC

9.0 Turn on VAC power source.

10.0 Measure voltages at J5 on the power board as follows:

J5-1 = DC Common, black wire
J5-2 = -15 VDC $\pm$ 5%, blue wire
J5-3 = +15 VDC $\pm$ 5%, orange wire
J5-4 = +12 VDC $\pm$ 5%, red wire

11.0 Connect DVM positive lead to **Red VM** terminal on tester.
12.0 Operate the tester's rotary switch through all five positions and note voltage on DVM as follows:

Position 1 = 27 to 29 VDC
Position 2 = 27 to 29 VDC
Position 3 = .4 to .6 VDC
Position 4 = .4 to .6 VDC
Position 5 = 2.4 to 2.6 VDC

13.0 Check actuator output with respect to DC Common inorder to verify the bridge is in the correct state. Measure the voltages at J2 as follows:

J2-1 and J5-1(common)	+25 to +29 VDC
J2-2 and J5-1(common)	+25 to +29 VDC

14.0 Power Board passes if all DVM readings match values in steps 10.0, 12.0, and 13.0.

15.0 Turn off all power and disconnect power board from tester.

COMBINED POWER BOARD AND CONTROL BOARD TESTS

For these next steps, the GC300 is tested after being fully assembled.

1.0 Wire the transformer to J4 and a power cord to J3 on the power board. Connect the J5 wiring harness from the bottom of the power board to J2 on the control board. Connect J1 on the power board to J5 on the control board with a ribbon cable. No other connections are to be made to the power board or the control board and EPROM, U7, must not be installed for this test.

1.1 Turn VAC power on and check the following power supply voltages on the control board:

TP1 and TP2	4.75 to 5.25 VDC
J8-1 and TP2	11.4 to 12.6 VDC
J8-6 and TP2	14.25 to 15.75 VDC
J8-7 and TP2	-15.75 to -14.25 VDC

2.0 Turn the power off and connect a sensor, PH16 or UH21, to J8 on the control board.

PH16:	Green	J8-1	(+12VDC)
	Red	J8-2	(Sensor Out)
	Black	J8-3	(Analog GND)
	White	J8-4	(Power supply GND)
	Shield	J8-5	(Chassis GND)
UH21:	White	J8-2	(Sensor Out)
	Black	J8-3	(Analog GND)
	Green	J8-4	(Power supply GND)
	GN/YL	J8-5	(Chassis GND)
	Red	J8-6	(+15VDC)
	Yellow	J8-7	(-15VDC)

Set SW2 as follows:

Sensor	**SW2-1**	**SW2-2**
PH16	OFF	OFF
UH21	OFF	ON

2.1 Turn R36 fully counter clockwise and rotate R39 to its center position.

2.2 Turn the power on. Measure the voltage between J8-2 and J8-3 on the control board while the sensor is unblocked. This voltage must be between 190mV and 350mV and dependent on the senor used. Record this voltage and then multiply it by 28 and record the result. It will be used in the next adjustment.

2.3 Connect the DVM across terminals J8-11 and J8-12 on the control board. Adjust R39 until the measured voltage is within 5% of the result calculated in step 2.2.

3.0 Turn R44 fully counter-clockwise.

4.0 Disconnect the VAC power. Program EPROM, U7, with the file R?_17070.nei (where '?' is the revision number) and install it in the control board. Turn the power on, and note that all of the front panel LED's flash on momentarily. Cycle the VAC power on and off (or the reset switch may be pressed and released) as many times as needed to verify that all the LED's are working.

5.0 Turn the VAC power off (wait for all the LEDs to turn off) then make the following connections on the power board.

J2-1 to 4 ohm, 100 W min., 1%, Resistor
J2-2 to 4 ohm, 100 W min., 1%, Resistor
J2-3 to J2-4
J2-5 to J2-6

5.0.1 Make the following connections on the control board.

J8-8 2 Kohm one turn Potentiometer lead
J8-9 2 Kohm one turn Potentiometer wiper

J7-4 Brown wire from proximity sensor
J7-5 Blue wire from proximity sensor

J3 Plug in Second Sensor Board/Simulator Board

5.0.2 **Entering Test Mode**: Toggle SW2-4 on then press the setup and the sensor keys at the same time. Next, while pressing the setup and the sensor keys turn the VAC power on. After all the front panel LED's turn on, quickly release the setup and the sensor keys. Only the setup-gain LED will remain on.

5.1 **Keypad Test**. Each key on the front panel must turn on a different LED on the bar graph display as shown below, 'X' is on and '0' is off.

SETUP_KEY	X000 0 0000
SENSOR_KEY	0X00 0 0000
AUTO_KEY	00X0 0 0000
AUTO_CENTER_KEY	000X 0 0000
MANUAL_KEY	0000 0 X000
LEFT_KEY	0000 0 0X00
ENTER_KEY	0000 0 00X0
RIGHT_KEY	0000 0 000X

5.1.1 Turn SW2-4 off and check to see that when the setup or sensor keys are pressed no LED's turn on. Turn SW2-4 back on.

5.1.2 To exit this keypad test press and hold the setup and then the sensor key, when the setup's offset LED turns on release both keys.

5.2 **Remote Setpoint Test**. The 2 Kohm Potentiometer will be used for the next test. Turn the pot fully in both directions to allow the GC300 to measure the entire voltage range. The bar graph's green LED will flash when the test is complete. If the bar graph's green LED does not flash after the pot is turned fully in both directions, the unit fails this test.

5.2.1 While the bar graph's green LED is flashing press the setup key and the setup's deadband LED will turn on.

5.3 **Auto Centering Sensor Test.** The proximity sensor will be used in the next test. Start with the proximity sensor at least 1/2 inch from a metal surface, then touch the proximity sensor's face to the metal surface. While the sensor is moving the GC300 will measure the sensor's output voltage range. The bar graph's green LED will flash when the test is complete. If the bar graph's green LED does not flash after the proximity sensor has been in both positions, the unit fails this test.

5.3.1 With the bar graph's green LED flashing press the setup key and the left sensor LED will turn on.

5.4 **Web Guide Sensor Test.** The edge sensor will be used in this test (UH or PH sensor). Start with the sensor's sensing window unblocked and then completely block it. The GC300 will measure the sensor's output voltage range. The bar graph's green LED will flash when the test is complete. If the bar graph's green LED does not flash after the sensor has been blocked and unblocked, then the unit fails this test.

5.5 **Current Measuring Calibration.** Connect the DVM's red lead to J2-1 and the black lead to J2-2 on the power board. **CAUTION**: Do not allow J2-1 and J2-2 to short together.

5.5.1 While the bar graph's green LED is flashing, press the setup key and the right sensor LED will turn on. Next, the green LED will turn off briefly while some calculations are made. While this is happening, note that the voltage displayed on the DVM is between 18 and 22 VDC. Monitor this voltage throughout the test. About 15 seconds after the bar graph's green LED turns back on it will begin to flash indicating the test was successfully completed. Then the voltage will drop to between 8 and 12 VDC. If the voltage drops below 18V before the front bar graph's LED starts to flash or it takes more than 30 seconds for the LED to begin flashing, the unit fails the test.

5.5.2 With the bar graph's green LED flashing press the setup key and the line follower LED will turn on.

5.7 **Sensor Selection Switch SW2 Test.** The bar graph LEDs must reflect the switch settings as shown in the chart below. Test each setting and if one or more switch settings do not give the correct LED pattern this test fails (X = LED ON; O = LED OFF).

Setting	**SW2-1**	**SW2-2**	**LED Pattern**
A	OFF	OFF	0000000**XX**
B	ON	OFF	0000000**X**0
C	OFF	ON	00000000**X**
D	ON	ON	000000000

5.7.1 The bar graph's green LED will flash after the last sensor setting has been entered. Return the SW2 settings to the settings appropriate for the edge sensor connected to the GC300.

5.7.2 With the bar graph's green LED flashing press the setup key and the auto mode LED will turn on.

5.8 **Second Sensor Board's Sensor Selection Switch Test.** This test will verify the sensor selection inputs from the Second Sensor Board's switch SW1. The bar graph LEDs must reflect the switch settings as shown in the chart below. Test each setting and if one or more switch settings do not give the correct LED pattern this test fails. (X = LED ON; O = LED OFF)

Sensor Setting	**SW1-1**	**SW1-2**	**SW1-3**	**SW1-4**	**LED Pattern**
A	OFF	OFF	OFF	OFF	00000**XXXX**
B	ON	OFF	ON	OFF	00000**X**0**X**0
C	OFF	ON	OFF	ON	000000**X**0**X**
D	ON	ON	ON	ON	000000000

5.8.1 The bar graph's green LED will flash after the last sensor setting has been entered.

5.8.2 With the bar graph's green LED flashing press the setup key and the auto-center LED will turn on.

5.9 **Temperature Sensor Test.** This test requires the ambient air temperature to be between 16°C (60.8°F) and 32°C (89.6°F). The GC300's internal temperature must be allowed to reach the ambient air temperature before attempting this test. The LED bar graph shows the temperature the sensor is reading and it must be within one LED of the ambient air temperature (X = LED ON; O = LED OFF).

Temperature °C	Temperature °F	LED Pattern
< 16.0 (See Note 1)	< 65.8 (See Note 1)	000000000
≥ 16.0	≥ 60.8	X00000000
≥ 18.0	≥ 64.4	XX0000000
≥ 20.0	≥ 68.0	XXX000000
≥ 22.0	≥ 71.6	XXXX00000
≥ 24.0	≥ 75.2	XXXXX0000
≥ 26.0	≥ 78.8	XXXXXX000
≥ 28.0	≥ 82.4	XXXXXXX00
≥ 30.0	≥ 86.0	XXXXXXXX0
≥ 32.0	≥89.6 (See Note 1)	XXXXXXXXX

Note 1: If one of these patterns is shown the test fails and either the sensor circuitry is bad or the actual ambient air temperature is out of the range of 16°C to 32°C. Verify the ambient air temperature is ≥16°C and < 32°C and that the GC300 has been at room temperature long enough to stabalize at this temperature and repeat the test.

5.9.2 Press the setup key and all the front panel LEDs will flash on and off two times.

6.0 Turn the VAC power off and wait for all the LEDs to turn off.

6.1.1 Replace the 4 ohm load resistor with a 24 VDC linear actuator and add End-Of-Travel Limit Switches or simulated limit switches to connector J2 on the power board.

J2-1	Motor
J2-2	Motor
J2-3	Left Limit (extend)
J2-4	Left Limit Common
J2-5	Right Limit (retract)
J2-6	Right Limit Common

6.1.2 Add a SPDT center off switch, which simulates the Auto Center function, to the control board as follows:

J7-1	Left of center contact on SPDT center off switch
J7-2	Right of center contact on SPDT center off switch
J7-3	Common pole on SPDT center off switch

The switch must close the contacts J7-1 to J7-3 and J7-2 to J7-3 when the switch is in the center position. Moving the switch to the left or right should break the appropriate contact. When the contact between J7-1 and J7-3 is broken this is considered a left of center condition. Likewise when the contact between J7-2 and J7-3 is broken this is considered a right of center condition.

NOTE: Make sure the SPDT switch is in the off (center) position before beginning the next test.

6.2 Turn the VAC power on. All the LED's will flash on and then off and the left Sensor LED, the Manual LED, and bar graph's green center LED will turn on.

6.3 **Edge Sensor Test.** Using the edge sensor and some opaque material, block the sensing window with the material and note that the left red bar graph LEDs turn on. Next, remove the material to unblock the sensing window and note that the right red bar graph LEDs turn on.

6.4 **Manual Mode Test.** Use the '+' and '-' keys to move the linear actuator. The '+' key will retract or extend the actuator, the '-' key wil do the opposite depending on how the actuator's motor is wired to the GC300.

6.5 **End-Of-Travel Test.** Each of the End-Of-Travel Limit Switches must be tested. If the limit switches are built into the linear actuator, use the '+' and '-' keys to move the linear actuator to its limits. If the limit switches are simulated with switches, open the desired contact to cause a limit to become active. The limit inputs need to be connected to DC common in the normal state and opened when a limit is reached. The bar graph will indicate which limit is reached by flashing all the red LED's on the appropriate side of the green center LED. For example, if a left limit is reached, then all the left red LED's will flash. The relay contacts on J7 change with the limit switch input status. The contacts on J7 must be checked for continuity as follows:

J7-6 & J7-8	Closed in normal state
J7-7 & J7-8	Open in normal state
J7-6 & J7-8	Open when left limit is reached
J7-7 & J7-8	Closed when left limit is reached
J7-9 & J7-11	Closed in normal state
J7-10 & J7-11	Open in normal state
J7-9 & J7-11	Open when right limit is reached
J7-10 & J7-11	Closed when right limit is reached

6.6 **Auto Mode Test.** Press the Auto key and the Auto LED will turn on and the Manual LED will turn off. The linear actuator must follow the opaque material's movement within the sensor's sensing window. By moving the material within the sensor's sensing window the actuator will change directions and speed. Gain can be increased to make the speed change more noticeable. To increase the gain press the setup key and the Gain LED will turn on, then use the '+' key to increase it. Finally, press the 'ENTER' key to save the gain change.

6.7 **Auto-Centering Test Using Prox Sensor.** Press the Auto-Center switch and the Auto-Center LED will turn on and the Auto LED will turn off. When the proximity switch is near metal the linear actuator will extend; when the proximity switch is away from metal the linear actuator will retract.

6.8 **Auto-Centering Test Using Switches.** Move the SPDT switch to the left of center position and the linear actuator will retract. Move the SPDT switch to the right of center position and the linear actuator will extend. Place the switch in the center (off) positionand the linear actuator will stop.

7.0 **Restoring Factory Default Values.** Turn the VAC power off. Set switches SW2-1 and SW2-2 to their off positions. Press and hold the setup key then turn the VAC power on. After all the LEDs flash on release the setup key.

8.0 Glue down R36, R39, R44 using glyptol.

9.0 Testing is complete.