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OPERATING PROCEDURES FOR OPERATION OF

GO-POWER SYSTEMS C-17

DIGITAL INSTRUMENTATION CONSOLE

GO-POWER SYSTEMS
C-17 Operation Manual

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GO-POWER SYSTEMS

WARRANTY POLICY

Go-Power warrants only that equipment of its own manufacture is free from defects in material and workmanship. This warranty shall be effective upon proper registration of warranty card, and shall under no circumstances, extend beyond a period of twelve months from delivery of equipment to purchaser. Go-Power's liability under the aforesaid warranty is limited to replacing or repairing at its plant defects of material or workmanship as are reported to it within the warranty period; this warranty shall not apply where the equipment has been altered or used negligently or for other than manufacturer's intended use. and under no circumstances shall Go-Power be liable for consequential damages. There are no other warranties, written or oral, expressed or implied, which extend beyond the description on the face hereof.

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* * * * * * NOTES, CAUTIONS AND WARNINGS * * * * * *

The use of notes, cautions and warnings are inserted in the text to emphasize important and critical instructions. It is important that these inserts be read and understood before performing any procedure described in this manual.

NOTE: An operating procedure or condition which is essential to highlight.

CAUTION: An operating procedure or practice which if not strictly observed could result in damage to, or cause destruction of the equipment involved.

WARNING: A warning which if not correctly followed could cause severe personal injury or possibly result in death.

WARNING

This equipment may have as high as 220 volts inside. No one other than a qualified electronic technician should ever attempt to service this equipment. Tampering with any of the internal wiring or parts may result in electrical shock or possible death. Do not subject this equipment to any liquids at any time.

WARNING

DO NOT operate any engine in a closed area without provision for expelling engine exhaust fumes. Before begining any test, ensure the engine or test cell has some sort of exhaust collection system with adequate ventilation in the test area. The engine exhaust gases contain carbon monoxide (CO) which is a poisonous gas and will result in death if inhaled for prolonged time in sufficient amount.

We at Go-Power Systems do sincerely appreciate your business now, as in the past. Hopefully we will continue to earn your your business in the future. We care about our customers and our products and are constantly striving to improve both our products and our reputation. We welcome your comments regarding this manual. Feel free to write to us at any time if you have a suggestion or comment. Our business is serving our customers.

GO-POWER SYSTEMS
C-17 Operation Manual

SECTION 1. UNPACKING:

Packaged in the original shipping container you should find the 3 following items:

1 each C-17 Instrumentation Console

1 each Tach/Torque Cable Assembly

1 each C-17 Operation Manual (this manual)

SECTION 2. HOOK-UP:

Connect the Tach/Torque Cable Assembly. Connect the larger, single connector end of the Cable Assembly to the C-17 Instrumentation Console. Connect the other end to the dynamometer by connecting the small black plastic connector to the mating connector found connected to the torque load cell. The Torque Load Cell will normally be found mounted as part of the dynamometer.
Now, connect the metal connector portion of the cable to the magnetic pick-up output connector, found on the top back end of the dynamometer.

Plug the Instrumentation Console into the mains voltage as required by your unit (see input power requirements).

SECTION 3. INPUT POWER REQUIREMENTS:

All C-17 units come equipped for operation at either 115 VAC ±10% or 220 VAC +5%, -10%. Units equipped with an "american standard" household plug are built for operation at 115 Volts AC. Units equipped with an european "DIN standard" plug (units for export) or supplied without an AC plug are built for operation at 220 VAC. If the unit as received is not built as required for operation at your required line voltage, return unit to factory for voltage conversion as this unit cannot be user converted. All units are designed for 50 Hz, 60 Hz and 400 Hz operation as equipped from the factory. Power consumption of the C-17 is 14 watts.

NOTE: If the input line voltage falls below 100 volts, for a unit designed for 115 VAC operation (or 200 volts for a 220 VAC unit), the unit will Self-Test continuously.

SECTION 4. FEATURES OF THE C-17 INSTRUMENTATION UNIT:

The C-17 Instrumentation Unit is designed to measure engine torque or engine power as well as engine RPM (revolutions per minute).

This unit is designed to measure either 1 to 199.9 units (English or Standard International units-of-measurement) of torque or power or 1 to 1999 units of torque or power depending on the dynamometer this unit is used in conjunction with.

The Automatic Self-Test feature of this unit is designed to assure constant accurate, dependable readings of all dynamometer measurements.

A feature not found on any other equivalent small instrumentation unit is the Precision Compensating Load Cell Excitation Circuitry. A precise 10.00 volts is applied directly to the load cell itself despite connection resistance, cable resistance, load cell current or power supply variations. This feature alone assures accurate consistent torque measurements over time. As components age, connections change in resistance or even the torque cable get changed to a longer length the excitation at the load cell will remain at a fixed 10.00 volts.

SECTION 5. OPERATION AND FUNCTIONS:

Front Panel;

Torque/Power Display;

This display indicates torque or power units (switch selectable on the front panel), in either English or Standard International (SI) units-of-measurement. The standard C-17 is constructed to display torque and power in English units of measurement. C-17 units requiring torque and power to be displayed in SI units of measurement must be special ordered as such.

RPM Display;

This display indicates the revolutions-per-minute (RPM) of the dynamometer. If the engine is direct coupled to the engine drive shaft (a 1 to 1 engine to dyno speed ratio), then this indication will also indicate the RPM of the engine itself, however, if the connection between engine and dyno is made through a pulley arrangement with either an increasing or decreasing speed ratio then that ratio must be taken into consideration to calculate actual engine speed.

Self-Test Indicator Lamp;

The LED indicator in the middle of the console face indicates the status of the Self-Test function. The Self-Test circuit functions automatically "each time power is applied" to indicate the results of conditions at that time. The Self-Test function is used to test the condition of the torque, power and RPM circuits for correct operation as well as calibration of these circuits. All calibrations are checked except the 2 display meter calibrations. The Self-Test circuit also checks the torque transducer and torque cable assembly for an open condition. For an accurate Self-Test the engine should not be running when applying power to the console. If the engine should be running or the console power turned off and on during operation of the engine, the Self-Test indicator will turn red the end of the 20 second test interval and remain red until the engine is stopped and the console power reapplied (providing everything else meets Self-Test requirements). If this condition does occur testing may continue normally as actual test data is not affected by this type of a Self-Test failure.

Self-Test Status Interpretation;

Amber color of the Self-Test indicator indicates the Self-Test circuitry is in operation. This operation lasts for approximately 20 seconds each time input power is applied.

Green color indicates the console has passed Self-Test function and is ready to take accurate readings.

Red color of the indicator indicates that a defect has been found by the Self-Test circuitry which indicates one or more of the following conditions:

a. The instrumentation requires recalibration because of a change in the Torque Transducer (see Torque Transducer calibration section of this Manual).

b. A broken or disconnected torque cable.

c. A defective or disconnected Torque Transducer.

d. The engine was running when the C-17 line power was applied.

e. A binding within the dynamometer assembly. A bind that applies a constant pressure to the torque transducer when the dynamometer is not turning can cause the unit to fail Self-Test. This would most likely be caused by a sticking or bad bearing (See the dyno manual for maintenance information).

/Continued . . .

Self-Test Status Interpretation; (continued)

Red status (continued)

f. A large change in the Torque Transducer calibration settings may cause the unit to fail Self-Test.

g. a defect in the instrumentation console

h. the following applies only to dynos other than a D-100 and equiped with a hydraulic type torque transducer. An air pocket trapped in the torque transducer hydraulic fluid. See the Maintenance section of the dynamometer manual for maintenance of the hydraulic transducer.

NOTE: Because the Self-Test function is initiated by a power-on condition, large "line notches" or momentary droops in voltage will cause the Self-Test circuit to reinitiate if the input line voltage drops below the 100 volt level (for a unit manufactured for 115 VAC operation or 200 volts for a 220 VAC operated unit). If, the engine is running at the time the line notch occurs the indicator will change from green to red and stay red until the engine and power are turned off and started in sequence again, however, this type of Self-Test failure will not effect the accuracy of readings.

Should your unit fail Self-Test and all of the above items have been checked as far as possible without results, call the Go-Power/Froude factory and ask for a Service Representative. The factory phone number is; 313/591-2110.

Torque/Power Switch:

This switch selects either Torque units or Power units to be indicated on the Torque/Power Display. The standard C-17 instrument will indicate in English units-of-measurement. English measurements will mean that torque will be read in pound-feet (LBFT) and power in Horsepower (HP). SI (Standard International) indicating units may be specified at the time of order.

On/Off Switch:

This switch applies line power to the instrument.

/Continued . . .

Rear Panel;

Torque & RPM Transducer Input Jack;

CONNECTOR FUNCTIONS

C-17 Input Connector Terminal	Function
5	Transducer positive (+) input
2	Transducer negative (-) input
3	Transducer remote positive (+) voltage sense
6	Transducer remote negative (-) voltage sense
9	Transducer (+) excitation
8	Transducer (-) excitation
1	Tachometer differential input
4	Tachometer differential input
7	Shield

CONNECTOR HARDWARE LIST

Go-Power Stock #	Qty Used/	Item Description	Function
837002	9	Pin, connector, crimp type	Pins for connector
837508	1	Strain relief,	Cable grip
837708	1	Connector, 9 pin	C-17 connector
840248	20ft	Cable, 4 pair with shield	Wire cable
837002	4	Pin, connector crimp type	For torque connector
837025	1	Connector, metal	Dyno tach pickup
837060	1	Connector, 4 pin	To Torque Transducer

SECTION 6. USER CALIBRATIONS

The only customer calibrations necessary are the torque transducer calibrations due to changes that occur naturally in the transducer itself. These calibrations can, if large enough, effect the Self-Test calibration.

Torque Transducer calibration is recommended at semiannual intervals (every 6 months) to insure the accuracy of torque and power readings.

There are two calibrations necessary and these are accessed from the bottom of the enclosure by removing the hole plug found there. These calibrations are necessary to calibrate the torque transducer to the instrumentation. Calibration may be performed by the Go-Power Factory by returning the load cell and instrumentation unit prepaid and a recalibration change will be billed to you. Or calibration may performed by the customer with the aid of one of the optional Go-Power calibration accessories:

1. A Go-Power "Torque Calibration Arm"
2. A Go-Power Model 25000 torque calibrator
3. If the dynamometer you are using is other than a D-100 model dynamometer and uses hydraulic type load cells for torque measurement, a Go-Power "Model 54610 Hydraulic Torque Calibrator" may be used to obtain a course calibration.

TORQUE TRANSDUCER CALIBRATION

Calibration may be required for any one of the following reasons and must be performed for reason number 2 & 3:

1. Routine calibration check.
2. Calibration required due to an error detected by the Self-Test circuitry due to torque transducer changes.
3. Replacement of the torque transducer due to failure.

NOTE: All calibration procedures must be made without running the engine.

OFFSET ADJUSTMENT
(first adjustment)

Purpose:

The purpose of the torque offset adjustment is to compensate for the inherent offset normally found in typical mechanical to electrical transducers (Load Cells). This adjustment is used to "offset" that inherent error to cause the torque output to indicate zero with no pressure applied to the device.

Procedure:

Set the Torque/Power switch to the "Torque" position. Before making the adjustment tap around the top back end of the dynamometer a few times with a rubber mallet to remove any hysteresis (bearing friction) that might be present at the no load condition. Slowly turn the offset pot in the direction that causes the torque reading to come to zero.

NOTE: If the offset adjustment does cause a change in readings when being adjusted but will not bring the torque reading to zero, this is an indication of a defective transducer.

NOTE: If zero was compensated for during the use of a Torque Calibration Arm, then zero must be re-adjusted after removing the Calibration Arm.

GAIN ADJUSTMENT
(second adjustment)

Purpose:

To compensate for an electrical output error found in a typical mechanical type transducer due to manufacturing tolerances. This compensation will cause the output readings to be accurate in spite of transducer errors.

Procedure:

There are three different procedures for calibrating Gain. The correct procedure to use will be based on the calibration equipment available, and torque transducer you are currently using. These procedures are:

Procedure A. is used to calibrate the instrumentation when the torque measuring device is an electrical Strain Gauge type Load Cell transducer and the calibrating device is a Torque Calibration Arm. This procedure is used for a D-100.

Procedure B. is used to calibrate the instrumentation when the torque measuring device is an electrical Strain Gauge type Load Cell and the calibrating device is a Go-Power Model 25000 torque calibrator. This procedure is for a D-100.

/Continued . . .

Procedure C. is used to calibrate the instrumentation when the torque measuring device is a Hydraulic type load cell which means the dynamometer is other than a model D-100

Procedure D. is used to calibrate the instrumentation when the torque measuring device is a Strain Gauge type Load Cell transducer and the dynamometer is other than a Model D-100

Procedure A. for calibration of: a Strain Gauge type Load Cell torque transducer using a Go-Power Torque Calibrating Arm (TCA)

1. Gather a set of calibrated weights. You'll need about 50 Lbs worth.
2. Mount the correct Go-Power Torque Calibration Arm according to the accompanying directions.
3. The calibration arm must be ordered in the same unit of measurement (English or SI) that the C-17 Instrumentation unit was manufactured for use in.
4. Fashion a basket to support the weights with and/or a hook as necessary to support the weights you will use.
5. With the calibration arm, basket and/or hook in place, perform the "Offset Adjustment" as outlined in the "Calibration" section.
6. Suspend the calibrated weights from the calibration arm.
7. Place the Torque/Power Switch (on the front panel) in the Torque mode.
8. Adjust the "Gain" adjustment pot until the display reading reads the same value as the calculated value.
9. Remove calibration arm, basket and hook and re-adjust the "Offset" adjustment to again read zero.

The length of the arm will multiply the display reading. The length of the arm times the weight added to it will be the reading on the display.

/Continued . . .

Example: If the Calibration Arm you are using is calibrated in Lb Ft (which means the C-17 unit must be an "English" unit of measurement model). You have adjusted the "Offset" adjustment to read zero 0000 after the arm and support was mounted. You placed 50 Lbs of weights on the support assembly and the arm was two feet long;

2 (feet, length of arm) X 50 (pounds of weight) = 100 FTLB of Torque (Display reading)

Procedure B. for calibration of: a Strain Gauge type Load Cell transducer using a Go-Power model #25000 torque calibrating device

1. Mount the bottom end of the the Load Cell on the Go-Power model 25000 Torque Calibration device according to the accompanying directions. Do not connect the top mount yet.

2. Set the "Torque/Power" switch on the front of the C-17 unit to the "Torque" mode.

3. Before the top mounting connection of the Load Cell is made, perform the "Offset Adjustment" as outlined in the "Calibration" section (page 6).

3. Increase the dial adjustment knob of the Go-Power 25000 torque calibrating device. Gauge readings are to be multiplied by .38 for display indication.

4. Adjust the "Gain" adjustment pot until the display reading reads the correct calculated value.

5. Remove calibrating device.

EXAMPLE: when the gauge dial indicator is adjusted to read 100 Lbs the gain adjustment should be adjusted until the display reads 38.0 Lbs (for an English unit of measurement model C-17).

Procedure C. for calibration of: a hydraulic type torque transducer which would be for other than a Model D-100 dynamometer.

Disconnect the torque sensor from the dynamometer and connect one of the following hydraulic pressure devices;

1. a commercial Hydraulic Dead Weight Tester
2. a Go-Power Hydraulic Torque Tester P/N 54610
3. your own make hydraulic load valve with an accurate gauge attached

Apply pressure from one of the above devices and adjust the transducer "GAIN" pot until the display readout reads the same value as indicated on the following chart:

Applied Pressure in PSI	Display Readout: Automotive dynos Lb Ft	Automotive dynos Nm	DT-1000 Lb Ft	DT-1000 Nm	DT-2000 Lb Ft	DT-2000 Nm
50	50	67.8	200	271	333	452
100	100	135	400	542	667	904
150	150	203	600	814	1000	1356
200	200	271	800	1084	1334	1808
300	300	406	1200	1626		
400	400	542				
500	500	677				

NOTE: If readings do not repeat well, perform the "Hydraulic Torque Transducer Service Procedure" found under the Routine Maintenance section of this manual.

Procedure C. for calibration of: a Strain Gage type Load Cell transd
for other than a Go-Power Model D-100 dynamometer

The procedure for calibration for a dynamometer transducer of oth.r than a D-100, is basically the same as for the D-100 dynamometer with eit.r the Torque Calibrating Arm or the Strain Gage Load Cell. For all Go-Pow. dynamometers with a Strain Gage Load Cell follow the instructions found under Section 6. User Calibrations: Torque Transducer Calibration; use either Procedure "A" or "B" for Gain Adjustment depending on the type of calibration device you have available. The only difference is that in Procedure "B" step "1" the Load Cell will not be removed from the dynamometer and the Go-Power 25000 Torque Calibrator will mount on the dynamometer assembly instead.

SECTION 7. ROUTINE MAINTENANCE

For applications using D-100 type dynamometers the only maintenance inspection necessary is to check the Torque/RPM cable for cuts and scrapes on a monthly basis. This procedure can reduce down time due to complete cable failure.

The following procedure applies only if the model of Go-Power dynamometer you have in use employs hydraulic type Load Cells. (This would be other than a model D-100 dynamometer.)

Weekly:

If your Go-Power dynamometer system is in constant use, inspection for hydraulic leaks and cable cuts should be performed on a weekly basis.

Monthly:

Inspect hydraulic type torque transducer assemblies for leakage. If fluid is found leaking from any point of the transducer assembly it should be disassembled, the fittings cleaned carefully and reassembled using teflon tape or a similar sealer (see service procedure). All electrical cables and hydraulic lines should be inspected on a monthly basis. Inspect cables for cuts and fatigue of connector wire terminations especially if there is a good deal of flexing or pulling on cables.

Annually:

The hydraulic type of torque transducer should be serviced annually (see torque transducer service procedure). Perform torque transducer calibration on all models of transducers at least once a year. Drain trapped water out of the air pressure regulator water trap (for load valve) by pressing on the valve pin found on the bottom of the bowl.

Hydraulic Torque Transducer Service Procedure

If the transducer assembly is disassembled for any reason this procedure must be performed to remove any trapped air from the hydraul.. fluid.

1. Reference drawing #942506.

2. Disconnect the torque transducer from the hydraulic pressure line.

3. Using the appropriate fitting, attach the fluid pump from the fill kit (Go-Power P/N 43316) to the pressure fitting of the transducer (see item #3).

4. Rotate the transducer until the pump's top and the transducer bleed screw (see item #7) are straight up.

5. Fill the pump reservoir with silicone fluid (Go-Power P/N 41060).

6. Holding the pump and transducer so that the bleed screw is facing up, loosen the top nut of the bleed screw one full turn.

7. Begin pumping. Air and fluid should flow out of the bleed screw opening. Continue pumping until no air bubbles can be seen in the escaping fluid.

8. Close the bleed screw, disconnect the pump and reconnect the transducer to the hydraulic pressure line. This completes the service procedure.

SECTION 8. SERVICE

For troubleshooting guidelines read the "Indicator Red" (did not pass) portion of the Self-Test Section of this manual (page 3). Service is limited strictly to the following items:

a. Torque Transducer & RPM Transducer

b. Torque/RPM Cable

c. Dynamometer

/Continued . . .

SECTION 9. SERVICE (continued)

d. Circuit board fuse

A blown fuse in the C-17 Instrumentation Unit is not a likely condition as the fuse and supply design allow for a fair margin of voltage tolerance. However, it is possible for a large voltage transient to cause the line fuse to "blow". The symptom of a blown fuse is the lack of any indication of any light, what so ever, from any of the three light emitting displays on the face of the C-17 panel. These are:

1. The Torque/Power Display

2. The RPM Display

3. The Self-Test Status Indicator

If all three indicators are not lit then there is a possibility the board fuse is blown.

WARNING:

This equipment may have as high as 220 volts inside. No one other than a qualified electronic technician should ever attempt to service this equipment. Tampering with any of the internal wiring or parts may result in electrical shock or possible death. Do not subject this equipment to any liquids at any time.

CAUTION:

The following instructions must be followed carefully in order to keep from damaging the C-17 Instrumentation Unit.

Service of the circuit board fuse;

1. Unplug the line cord from its power service receptacle.

2. Remove the 4 front panel screws with a #2 phillips screwdriver.

3. Place your fingers along the front face with your palms along the sides. Carefully turn the front panel face down and let the front panel fall into your fingers.

4. Carefully remove the enclosure from the front panel assembly. Do not pull as the front panel is attached to the inside rear of the enclosure by a cable assembly.

/Continued . . .

Service of the circuit board fuse; (continued)

5. The fuse is located on the rear (facing away from the front panel) printed circuit board assembly between the transformer and the edge of the board. Check also to see if the M.O.V. (red disc next to fuse) is blown. If the MOV is blown return the C-17 to the factory for repair.

6. Remove and check the F1 fuse. Replace if necessary. The Go-Power fuse part number is; 834151. Never substitute a larger amperage fuse as this could damage the unit and create a possible fire hazard.

7. Reassemble the enclosure to the front panel assembly. Replace the 4 mounting screws.

8. Plug the line cord into the proper receptacle and apply power.

9. If the fuse blows again do not attempt to replace the fuse a second time, as this is an indication of a problem other than the fuse itself. Box up the C-17 assembly with the Load Cell Transducer (remove this from the dynamometer assy). Return the Instrumentation Unit and Transducer to the Go-Power factory for service.

There are no other user serviceable parts inside the C-17 Instrumentation Unit.

NOTE: Any attempt to alter or service any other portion of the interior of the C-17 Instrumentation Unit will void the user warranty.

SECTION 9. INTERCONNECTION CABLE

The standard C-17 Torque/Tach Cable is 20 feet in length. A cable of any length up to 100 feet long may be special ordered thru your Go-Power Sales Agent. The C-17 Instrumentation Unit has a unique circuit that automatically compensates for cable length. Therefore cables may be changed at any time to any practical length without re-calibrating.

SECTION 10. RECOMMENDED SPARES LIST

It is recommended that the following items be carried as "spare pa " in order to reduce possible "down time" due to the failure of these items in field use;

1. C-17 Interconnection Cable

2. C-17 board fuse Go-Power P/N 834151.