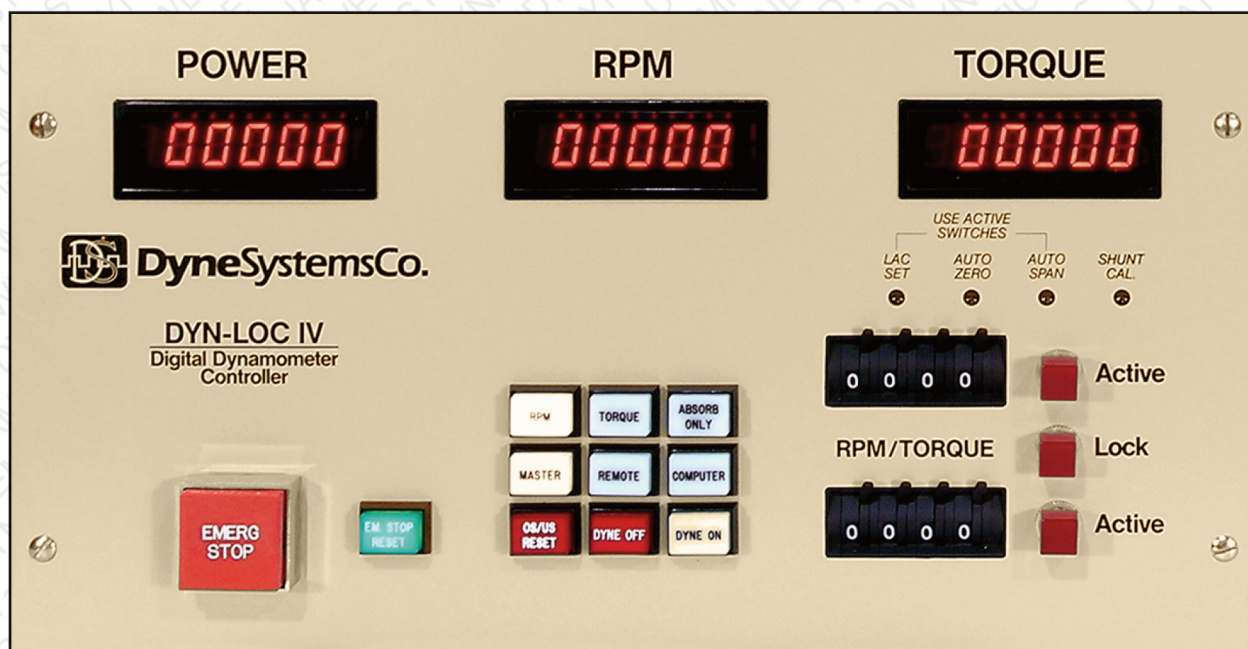




DyneSystems, Inc.

Midwest & Dynamatic Dynamometers



Dyn-Loc IV QUICK START GUIDE

Dyn-Loc IV Quick Start Guide (For Eddy-Current Dynamometers)

This Quick Start Guide helps to get the Dyn-Loc IV dynamometer controller configured and running quickly. Other Quick Start Guides are available for specific AC dynamometer/drive combinations. While this Guide helps to get started quickly, it is not a substitute for The Dyn-Loc IV User Manual. Refer to the manual for details not specifically covered in this guide. The manual can be found on our web site:

www.dynesystems.com

NOTE: This quick Start Guide applies to units with serial number greater than 748 only.

Assure that the following required material is on hand before beginning:

- Dyn-Loc IV User Manual
- Various types of multi-conductor shielded cable for transducer connections (see table at the end of this document)
- Mating MS Series connectors, (see table at the end of this document)

Use of this guide requires that the dynamometer be connected to a Device Under Test (DUT). The DUT must be capable of rotating under the control of a speed control or throttle position control.

NOTE: If the DUT is not operational, energizing the eddy-current dynamometer is **NOT** recommended. The DUT must be fully operational to carry out the Quick Start Guides' process in its entirety. However, connecting and testing of the speed and torque transducers may be carried out without a functional DUT, reference sections 3 and 4 of this quick start guide.

This guide outlines steps needed to bring the Dyn-Loc IV to operational status as quickly as possible. Execute these steps exactly in the order presented:

1. Safety Review
2. Dyn-Loc IV Power Connections
3. Speed Transducer Connection & Configuration
4. Torque Transducer Connection & Configuration
5. Dyn-Loc IV Eddy-Current Power Amplifier Connections
6. Water Safeties Interlock
7. Field Current Adjustments
8. Enabling the DUT
9. Enabling the Dyn-Loc IV Controller



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1 SAFETY REVIEW

Installing and operating this equipment involves hazards relating to rotating equipment and dangerous electrical voltages. To avoid the possibility of serious or fatal injury, only qualified persons familiar with industrial electrical power systems should install power wiring. Review all safety considerations in the manual before executing any steps in this guide or making any adjustments to the Dyn- Loc IV. It is recommended that a licensed electrician perform all power connections exceeding 50 Volts.

2 DYN-LOC IV POWER CONNECTIONS

Follow the below steps to connect and supply power to the Dyn-Loc IV:

1. Ensure all incoming power is de-energized prior to proceeding.
2. Place the Dyn-Loc IV controller in a rack or on a suitable surface.
NOTE: The Dyn-Loc IV is a rack mountable unit. Rack mounting is recommended due to exposed connections on the Dyn-Loc IV barrier strip.
3. Connect the control transformer secondary (typically 120 VAC) power wires to terminals L3 and L4 on the barrier strip found on the back of the controller.
NOTE: If the control transformer secondary supplies 230 VAC to L3 and L4 then the 115V/230V switch inside the Dyn-Loc IV must be set for 230VAC. This switch is located in the back left corner of the bottom circuit board.
4. Connect the field transformer secondary (typically 240 VAC, 277VAC maximum) power wires to terminals L1 and L2 on the barrier strip found on the back of the controller.
NOTE: Incoming power to both the control and field transformer primary windings **must** be fed from the same phase pair. Damage may result from improper phasing.
5. Energize both the control and field transformers. The RPM, MASTER, EM STOP RESET push buttons, digital LED display, and ACTIVE button on the front of the controller will illuminate.
6. De-energize both the control and field transformers.
7. If the push buttons and digital LED display illuminate as expected, proceed to the next step. If not, reference the Dyn-Loc IV user manual or contact Dyne Systems before proceeding.

3 SPEED TRANSDUCER CONNECTION & CONFIGURATION

Refer to the manual (Chapter 8, Section 3) for details on wiring and (Chapter 4, Sections 3 and 4 and Chapter 5, Section 11.4) for configuring a speed transducer. All speed transducers are terminated at the “RPM F.B.” connector located on the back of the Dyn-Loc IV. A mating 7-pin MS connector is required and can be constructed using items 9, and 10 listed in the **Connector Components** table at the end of this guide. Follow these steps in the order presented:

1. Ensure all incoming power is de-energized prior to proceeding.
2. Determine the type of speed transducer to be used. Two types of speed transducers are supported: Magnetic Pickup Units (MAGPU's); and Single-Ended encoders. A complete list of pin assignments on the “RPM F.B.” connector is shown in the Dyn-Loc IV User Manual (Chapter 8).

- **Magnetic Pickup Unit Wiring** – If the system uses a Magnetic Pickup, refer to the table below, the Dyn-Loc IV User Manual and supplied drawings for wiring details. Complete the sensor wiring as indicated.

Magnetic Pickup		
Belden 8761 (Item 1 in Cable table)		
Pin	Wire	Function
A	Clear	MAGPU (+)
B	Black	MAGPU (-)
C	Shield	Not connected on the sensor end

- **Single-Ended Encoder Wiring** – If the system uses an Encoder, refer to the table below, the Dyn-Loc IV User Manual and supplied drawings for wiring details. Complete the sensor wiring as indicated.

Encoder – Single Ended Output		
Belden 9534 (Item 2 in Cable table)		
Pin	Wire	Function
G	Red	Encoder Excitation (+12 VDC)
C	Black	Encoder Excitation Common
	Shield	Not connected on the sensor end
D	Green	Direction (Optional)
E	Green	Channel B (Optional)
F	White	Channel A

NOTE: Never apply power to the Dyn-Loc IV during sensor wiring.

The cable shield must be connected on the Dyn-Loc IV end only, leave shields unconnected at the transducer end to avoid ground loop signal problems.

Single-ended encoders require additional hardware adjustments.

- Using the DIP switches listed below select the type of speed feedback input source you are using. The following DIP switches are located on the DS501 circuit board (bottom center board inside the Dyn-Loc IV):

SW3-3	SW3-4	SW1-1	SW1-2	SW1-3	Setting
OFF	ON	OFF	OFF	OFF	Two wire magnetic pickup.
ON	OFF	OFF	OFF	OFF	Encoder pickup non-direction sensitive.
ON	OFF	ON	OFF	OFF	Encoder pickup with direction bit output.
ON	OFF	OFF	ON	OFF	Encoder pickup with direction derived from B channel encoder signal.
ON	OFF	OFF	OFF	ON	Encoder pickup with direction derived from two channel encoder signal but inverts the direction.

- Energize both the control and field transformers.
- Test speed transducer by rotating the system (by hand if possible). A speed reading should appear on the RPM display.

NOTE: If a magnetic pickup is used, a minimum speed (as a few hundred rpm) may be as high required before a RPM reading is displayed.

4 TORQUE TRANSDUCER CONNECTION & CONFIGURATION

Refer to the Dyn-Loc IV User Manual (Chapter 8, Section 2) for details on wiring and (Chapter 4, Sections 5-9) for configuring a torque transducer. All torque transducers are terminated at the “LOAD CELL” connector located on the back of the Dyn-Loc IV. A mating 6-pin MS connector is required and can be constructed using items 11 and 12 listed in the **Connector Components** table at the end of this document. Follow these steps in the order presented:

1. Ensure all incoming power is de-energized prior to proceeding.
2. Determine the type of torque transducer to be used. Two types of torque transducers are supported: Load Cell and Inline Sensor. A complete list of pin assignments on the “LOAD CELL” connector is shown in the Dyn-Loc IV User Manual (Chapter 8, Section 2).
NOTE: Some sensors labeled “Inline Torque Sensors” should be wired and configured as a Load Cell. Contact Dyne Systems for assistance with this configuration.
3. Refer to the following tables, the Dyne-Loc IV User manual and supplied drawings for wiring details. Complete the sensor wiring as appropriate.

Load Cell		
Belden 9534 (Item 2 in Cable table)		
Pin	Wire	Function
A	Red	Excitation (+10 VDC)
D	Black	Excitation Common
	Shield	Excitation Common
C	Green	Input (+) Signal
B	White	Input (-) Signal
DS105 PC board (solder) jumpers: JP2 installed, JP1 not installed		

In-Line Torque Sensor		
Belden 8761 (Item 1 in Cable table)		
Pin	Wire	Function
B	Clear	Torque Sensor Input
Both C and D	Black	Torque Sensor Input Common
D	Shield	
DS105 PC board (solder) jumpers: JP1 installed, JP2 not installed		

NOTE: Never apply power to the Dyn-Loc IV during sensor wiring.

The cable shield must be connected on the Dyn-Loc IV end only, leave shields unconnected at the transducer end to avoid ground loop signal problems.

Additional hardware may be required for In-Line torque sensor applications.

4. The torque display decimal point location is set from the Dyn-Loc IV front panel. Access the DIP switches by removing the torque display bezel. Set switches #4 and #5 as shown on the table below.

Torque Display Decimal Place		
TQ display Switch #5	TQ display Switch #4	TQ Display
OFF	OFF	00000
OFF	ON	0000.0
ON	OFF	000.00
ON	ON	00.000

NOTE: The power display decimal point location matches the torque display decimal point.

When configuring lever wheel set points (torque), an implied decimal place must be used to match the displayed decimal point location.

5. Ensure that the dynamometer and sensor mounting are free of any external forces that could interfere with torque readings.
6. Energize both the control and field transformers.
7. Calibrate the torque transducer as follows:
 - a. Attach the calibration arm to the dynamometer and attach the weight hanger.
 - b. Press and release the AUTO ZERO button on the Dyn-Loc IV. This will zero the torque display.
 - c. Hang the calibration weights. Calculate the calibration torque reading by multiplying the check arm length (from the dynamometer nameplate) with the amount of weight applied.

$$Torque(ft - lbs) = Check\ Arm\ (ft) * Weight(lbs)$$
 - d. Configure the active lever wheel for the calculated calibration torque and press the "Auto-Span" button to calibrate.
 - e. Remove the calibration weights.
 - f. Ensure the torque display returns to zero. If yes proceed to step "g", if no, return to step "b".
 - g. Remove weight hanger, and calibration arm.
 - h. Press and release the AUTO ZERO button on the Dyn-Loc IV.
 - i. Ensure the torque display value returns to zero, if not, return to step "h".

NOTE: Refer to the HELP number descriptions in the Dyn-Loc IV User Manual (Chapter 9) for HELP XXXX messages appearing on the display during the calibration process.

When the eddy-current dynamometer is absorbing and the system is rotating with positive speed values, the torque readings should also be positive. If not, a wiring error may exist. (If so, swap wires on pins B and C of the 6 pin M.S. torque connector)

8. Refer to the calibration section of the Dyn-Loc IV User Manual for additional calibration information.

NOTE: In-line torque sensors can be calibrated either with calibration arms and weights or by performing a shunt calibration. (Refer to Chapter 4 of the Dyn-Loc IV User Manual)

5 EDDY-CURRENT POWER AMPLIFIER CONNECTIONS

The internal Eddy-Current Power Amplifier (ECPAU) must be connected to the dynamometer coil (F1, F2) and the external field transformer (L1, L2) (See Section 2 Dyn Loc IV Power Connections). The water safeties of the dynamometer must also be wired to the H20 and IL terminals on the barrier strip.

NOTE: The ECPAU internal to the Dyn-Loc IV is rated for 277VAC maximum and 16AMPS maximum. If dynamometer coil specifications exceed these values an external ECPAU is required, contact Dyne Systems for additional information.

6 WATER SAFETY INTERLOCK

Water safety interlocks on the Dyn-Loc IV are critical in detecting a dynamometer coolant loss condition. Loss of coolant while the dynamometer is being loaded will result in overheating and likely cause severe damage to the dynamometer.

The water safeties interlock can be found on the barrier strip on the back of the Dyn-Loc IV. The water safeties interlock connections are located on the left end of the barrier strip and are labeled as "H20 and I.L.". Safety devices, such as pressure, flow, and temperature dry contacts, must be connected in series. When adequate coolant pressure and flow is supplied to the dynamometer all these contacts should be closed. Without closed water safeties the Dyn-Loc IV will not maintain a DYNE ON condition.

NOTE: Only use dry contacts, which are contacts not connected to any other circuits or power sources.

7 FIELD CURRENT ADJUSTMENTS

DYNAMOMETER CURRENT SETTING

The current limit adjustment is made using the CFB (Current Feedback) potentiometer on the DS256 circuit board (location: Dyn-Loc IV left side panel). This adjustment allows adaptation to a wide range of dynamometer field specifications, provides protection for the dynamometer coil, and can influence stability of the dynamometer's control.

NOTE: The fuses located on the rear panel of the Dyn-Loc IV must be sized to protect the dynamometer coil. The minimum fuse size allowed is 2.0A. The fuse chosen should provide adequate over-current and short circuit protection and be sized based on the field coil current rating on the dynamometer's nameplate. The voltage rating of the fuse must exceed the voltage used on the secondary of the field transformer.

Use the following procedure for eddy current dynamometers only. As mentioned in Section 5, if the dynamometer nameplate calls for more than 16 Amps field current, or the field transformer is greater than 277VAC, an external ECPAU must be used. Exceeding these limitations will damage the Dyn-Loc IV.

1. Ensure Dyn-Loc IV is powered down.
2. Determine the appropriate current measurement location for the application:
 - a. Clamp on a current meter, capable of measuring DC current, around one of the dynamometer field wires.
 - b. Voltage measurement from test points TP7 to TP8 on the DS256 board. In standard applications, 0.01 volts across the resistor is equivalent to 1 amp of field current. TP7 and TP8 is equivalent to the voltage across the gold power resistor found on the heat sink.
3. Turn the CFB potentiometer fully clockwise (1.2 Amps minimum field current will result)
4. Determine the specified field current rating (on nameplate) for the dynamometer. Where applicable, use the "hot amps" (lesser) value.
5. Apply power to the Dyn-Loc IV
6. Assure the dynamometer is at a standstill
7. Press the TORQUE push button.
8. Set the active lever wheel switches to 9000.
9. Press the DYNE ON push button.

NOTE: If the H2O interlocks are made, the control should latch DYNE ON. If the DYNE ON lamp drops out, check the H2O Interlock. If the under speed trip has not been disabled, the Dyn-Loc should trip after about one second. This will cause the OS/US RESET push button to light and a high braking condition (current limit) on the field. You will have one minute to adjust the CFB potentiometer. If it times out repress the DYNE ON button.

10. Turn CFB potentiometer counter-clockwise until you achieve the dynamometer rated field current. **Do not** exceed the field rating.
11. Push DYNE OFF push button, and OS/US RESET push button simultaneously. Leave the meter connected for the next test.

ADJUSTING THE FAULT CURRENT

The fault current is the current that will be applied to the field if an E-stop, over speed, or under speed occurs. The fault current needs to be adjusted for the application, adjust the fault current as follows:

1. Press the RPM push button to place the controller in RPM mode.
2. Press E-Stop button.

NOTE: You will have one minute to adjust the Fault Brake pot found on the DS501 board. This is the center board found in the bottom of the Dyn-Loc. The DYNE ON times out after one minute. If adjustments are incomplete, press the DYNE ON button again.

3. Press the E-Stop reset button
4. Press DYNE OFF push button and OS/US RESET push button simultaneously

8 ENABLING THE DEVICE UNDER TEST (DUT)

An eddy-current dynamometer is an energy absorbing device that is not capable of driving a system. The eddy-current dynamometer is driven by the DUT, typically either an engine or an electric motor. Follow these steps in the order presented:

NOTE: Speed control of the DUT is required for the below process.

1. Enable the DUT speed control and rotate the system to a safe speed.
2. Be sure that stable speed control of the DUT is achieved.
3. After the DUT and dynamometer are rotating and a speed value is displayed on the Dyn-Loc IV, proceed to Section 9 “Enabling the Dyn-Loc IV Controller”.

9 ENABLING THE DYN-LOC IV CONTROLLER

Before enabling the controller for the first time, set the over speed trip by using the thumb wheel switches on the back of the Dyn-Loc IV. Based on DUT performance specifications, select an appropriate over-speed value. Note that the over-speed setting is in x100 rpm increments.

IF STARTING IN TORQUE MODE:

1. Press the TORQUE push button, this will put the Dyn-Loc IV in Torque Control Mode.
2. Set the desired Linear Acceleration (LAC, also known as ramp rate) into the active lever wheels.
3. Press the LAC SET button to set the Linear Acceleration (display units per second) value.
NOTE: LAC should be set to match application requirements.
4. Set both front lever wheels to different desired torque setpoint values.
5. Press the DYNE ON button.
6. Observe, the Dyn-Loc IV should control to the active torque setpoint. Ensure accurate and stable control response.
7. Press the non-illuminated ACTIVE button.
8. Observe, the Dyn-Loc IV should control to the newly active torque setpoint. Ensure accurate and stable control response.
9. When done, press the DYNE OFF button (next to the lever wheel switch) to unload the device under test.

IF STARTING IN SPEED MODE:

1. Press the RPM push button, this will put the Dyn-Loc IV in Speed Control Mode.
2. Set the desired Linear Acceleration (LAC, also known as ramp rate) into the active lever wheels.
3. Press the LAC SET button to set the Linear Acceleration (display units per second) value.
NOTE: LAC should be set to match application requirements.
4. Set both front lever wheels to different desired speed setpoint values. The active setpoint value must match idle/base speed of the DUT. The inactive setpoint value must be just under the idle/base speed of the DUT.
5. Press the DYNE ON button.
6. Observe, the Dyn-Loc IV should control to the active speed setpoint. This should result in little speed variation and minimal torque application.
7. Press the non-illuminated ACTIVE button.
8. Observe, the Dyn-Loc IV should control to the newly active speed setpoint. Ensure accurate and stable control response.
9. When done, press the DYNE OFF button (next to the lever wheel switch) to unload the device under test.

CONNECTORS AND RELATED PARTS

CABLE:

Item	Description	Manufacturer + P/N
1	Multi-conductor cable, 1 twisted pair, 22 AWG, shielded	Belden 8761
2	Multi-conductor cable, 4 conductors, 24 AWG, shielded	Belden 9534

CONNECTOR COMPONENTS:

Item	Description	Manufacturer + P/N
1	15 Pin, DSUB Connector Male for 4QUAD	AMP 205206-9
2	25 Pin, DSUB Connector Male for DTC	AMP 5205208-1
3	37 Pin, DSUB Connector Male for REMOTE	AMP 205210-8
4	Male Crimp Pin for DSUB Connector	AMP 205089-1
5	Female Crimp Pin for DSUB Connector	AMP 205090-1
6	Metalized Plastic Shell for 15 Pin DSUB Connector	3M 3357-6515-1C
7	Metalized Plastic Shell for 25 Pin DSUB Connector	3M 3357-6525-1C
8	Metalized Plastic Shell for 37 Pin DSUB Connector	3M 3357-6537-1C
9	7 Pin Male RPM	AMPH MS3106A-16S-1P
10	7 Pin Strain Relief	AMPH 97-3057-1008-1
11	6 Pin Male LOAD CELL	AMPH MS3106A-14S-06P
12	6 Pin Strain Relief	AMPH 97-3057-1007-1
13	9 Pin DSUB Connector Female for Serial Port	AMP 205203-1
14	Metalized Plastic Shell for 9 Pin DSUB Connector	3M 3357-6509-1C