

# Digital Micro Force 2 Manual

ver. 1.1



fig.1. Digital Micro Force 2 control descriptions

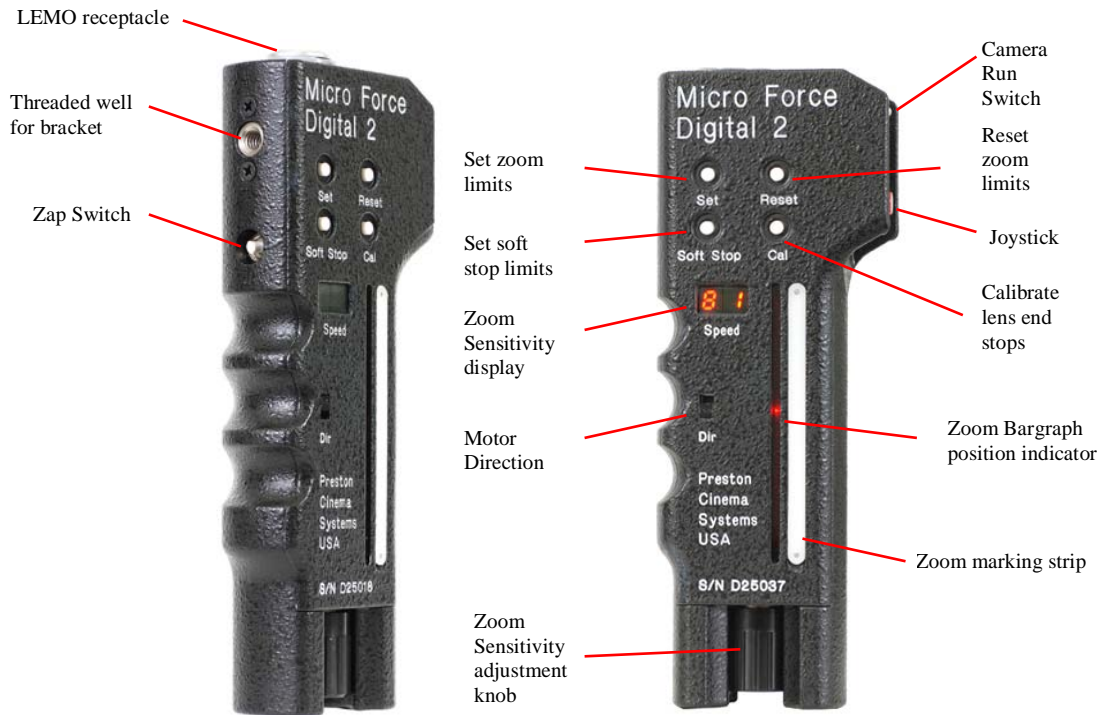


fig. 2 Microforce control with Pan Arm Adapter accessory p/n 1155 for 3/4" and 17mm pan bars.



## Digital Microforce 2

1. Introduction. The new Digital Microforce 2 builds upon the same robust force sensor technology which made the Micro Force an industry standard. The Digital Microforce 2 features automatic lens calibration, electronic limit setting, and a bright LED bargraph display of zoom position. This latest version adds programmable soft stops and a new speed control knob with a digital readout.

The rugged housing, machined from solid aluminum alloy, protects the control from mechanical abuse and assures years of reliable operation. Its ergonomic design provides a rounded grip for comfortable all day use and also offers a convenient attachment point for its mating Pan Arm adapter. The new speed control knob is virtually indestructible. It turns with glassy smoothness that reflects on the careful design used throughout.

The unit can drive the DM1, DM2 or DM1X digital motors. Its powerful drive capability assures trouble free operation with even the largest zoom lenses. Motor connection is made via a series of molded "Y" cables. These cables are available for both film and video cameras and allow the Digital Microforce 2 to remotely control the camera run/stop or VTR functions respectively.

The Digital Microforce 2 also supplies the analog command signal for controlling the zoom channel of the FI+Z system, the internal servos of video lenses, or the Radio Micro Force wireless module.

2. Power Connections. The Micro Force may be powered using the following types of cables:
  - a. "Y" -Cables: (product series 1200) for specific film and video cameras. Micro Force power is drawn directly from the accessory socket on the camera.
  - b. Video Cables for Canon, Fujinon and Nikon lenses. Power is drawn from the 12 pin Hirose connector on the lens.
  - c. Zoom cables (series 4444, 4445) for use with the FI+Z system.
  - d. Auxiliary power cables (product series 1128-1130) may be used in conjunction with "Y" cables to power the control directly from a battery.
3. Power requirements. The Micro Force operates over a voltage range of 11 - 30 VDC (max). Idle current is 55mA at 24 VDC or 95mA at 12VDC. The maximum current drawn under stalled motor conditions is 1.2A @ 24V (typ.) or 2.4A at 12V. The actual current requirement is proportional to the operating torque and the current limit set on the circuit board.
4. Operating Procedures. CAUTION. The motor will start rotation as soon as power is applied to the unit. Make sure your hand is clear of the moving gear!
  - a. Attach the DM1, DM1X, or DM2 motor to the matte box support rods using a 19mm motor swing arm (product series 4300) with a step down bushing for 15mm or .625" rods if required. Make certain that the rods are secured against rotation. Use the Arri or Panavision Bridge (4304, 4311) to prevent 15mm or .625" rods from twisting.
  - b. Position the motor so that its gear teeth are engaged with the corresponding teeth on the zoom ring of the lens. Auxiliary gears (product series 4231, 4240, 4241) are available to enable the motor to drive either Panavision 48 DP gearing or .50m / .60m gears for Canon and Fujinon video lenses.

- c. Check that the gears are meshed just tightly enough to eliminate any play but not so tightly as to cause the gears to jam.
  - d. Connect the Microforce 2 to its power source. The green LED power indicator should be illuminated.
  - e. The motor will calibrate by finding the mechanical end stops of the lens. During this phase the motor current is limited to a low value so as not to apply excessive force to the lens. The bargraph indication will remain dark until this operation is completed.
  - f. After finding the end stops of the lens, the motor stops and the bargraph indicator will light indicating the position of the zoom setting.
  - g. The zoom speed and direction can now be controlled by applying pressure on the red joystick button.
5. Control Functions.
- a. The **Maximum speed/ Zoom Sensitivity control** is located at the bottom of the control. The adjustment range is 8 turns of the Zoom Sensitivity knob with a corresponding range of the digital display from 0 - 99.
  - b. The zoom speed and direction is controlled by applying finger pressure to the **red joystick knob** either towards the top or bottom of the control.
  - b. The **Direction switch** reverses the motor rotation.
  - c. The **Camera Run switch** has 3 positions; center Off, Toggle On (away from the joystick) and Momentary On towards the joystick). The Toggle On position is for cameras requiring a continuous signal to run (i.e. Arri 12V, Panavision, Aaton), while the Momentary On is for cameras requiring a short pulse to change from run to stop (i.e. Arri 24V, Moviecam, Sony, RED digital).
  - d. The **Zap** switch sets the control to maximum speed. Pressing this momentary switch allows the lens to be returned quickly to position despite a low maximum speed setting.
  - e. The **Set** button is used to set limits to the zoom range. To set limits, position the lens to the first limit using the joystick. While depressing the Set button, press on the joystick to move the lens to the other desired limit. Release the button. Now the lens will stop at these limits. Use the bargraph display to feather the move as the limit is approached. The **Reset** button erases the limits.
  - f. **The Lens Cal button** initiates the calibration procedure.
  - g. The **soft stop** function automatically slows the zoom motor as it approaches the end stops. The point where deceleration begins is programmed by pressing the Soft Stop switch (fig. 3 below) and setting the deceleration distance by pressing the joystick up or down. The lit area of the bargraph shows the relative distance over which deceleration takes place. Release the Soft Stop switch to resume normal bargraph display operation.

Fig. 3 Setting the soft stop distance



## 6. Troubleshooting Guide

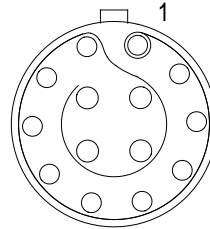
	Problem	Action
a	Power light is off.	Check power source. Is battery OK? Is power present at accessory socket? Check unit with auxiliary power cable. The thermal fuse may have opened. Remove power for 1 minute.
b	Motor stops during calibration	Is the gear mesh too tight? Does the lens bind? Check that the motor bracket doesn't move and that post through the motor is tight. Is the motor jammed? Check operation with motor decoupled from lens gear. Press the reset button and recalibrate the lens.
c	Power light is on but the zoom motor doesn't move.	Check the setting of the Speed Control. Was the set button pressed inadvertently without moving the zoom position? This will result in having the two limits next to one another - the span will be zero and the lens won't move! Press the reset button to clear any limit stops. Check that all the connectors are firmly seated
d	Zoom Motor creeps with no pressure applied to the joystick	See service guide Section 7.iv.3.

## 7. Technical Information and Service Guide

### i. LEMO 14 pin-out.

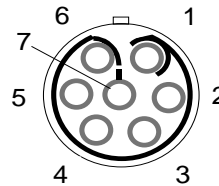
Type EGG2B314

1. Power
2. Gnd
3. Momentary Run (inverse)
4. Run
5. Run (inverse)
6. Vref input
7. Zoom Command output
8. Motor Plugged (inverse)
9. Encoder Channel B
10. Encoder Channel A
11. Encoder GND
12. +5V
13. Motor Drive A
14. Motor Drive B



### ii. DM-1, DM-2 LEMO pin-outs LEMO type EGG1B307 (receptacle)

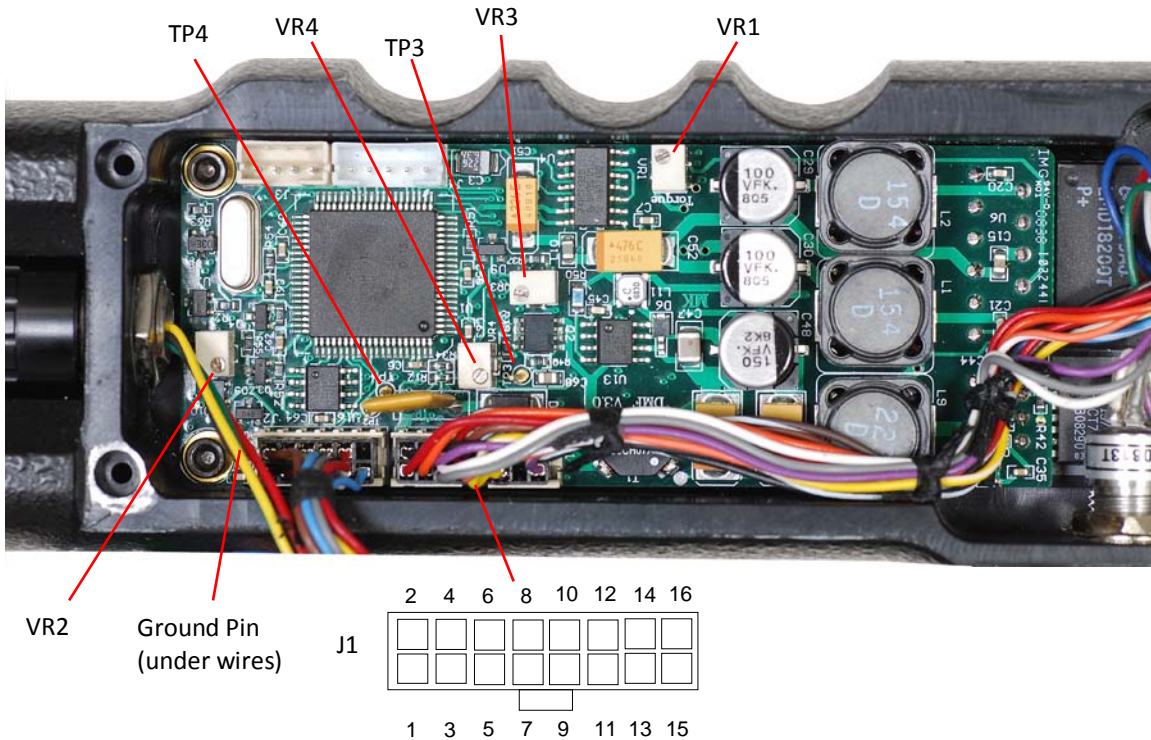
1. Motor Drive B
2. Motor Drive A
3. Encoder Channel A
4. +5VDC
5. GND
6. Encoder Channel B
7. Motor Plugged (inverse)



### iii. 16 pin Berg Housing

1. + Battery
2. - Battery
3. Switch common (momentary)
4. +joystick
5. Joystick output
6. - joystick
7. Video Ref input
8. Zoom Command output
9. Motor Plugged
10. Encoder Channel B
11. Encoder Channel A
12. GND
13. n/c
14. +5V
15. Motor Drive A
16. Motor Drive B

Fig.3 Circuit board showing test points and potentiometer locations.



iv. **Testing and Adjustment procedures.** CAUTION: These tests involve measuring voltages on the pins of integrated circuits and /or test points with very fine spacing. Accidentally shorting adjacent pins MAY DESTROY the devices. Only a skilled technician should undertake these tests. Refer to fig. 3 for test point and potentiometer locations.

1. Power supply operation. The digital Micro Force has four switching power supplies; controlled by IC's U12, U13, U14 and U20. All four supplies are active when the Micro Force is driving a digital motor. They generate +23.5V, +9V, +5V and +3.3V/ -3.3V respectively. U12 acts as a voltage booster in that its output voltage is 23.5V for input voltages less than 22V, and its output voltage tracks the input voltage for voltages greater than 22V.

When the control is used in the Analog mode for generating a Zoom command signal to control the FI+Z zoom channel or operate the internal servo of a video lens, the +5V and +23.5 V supplies are turned off to minimize current consumption.

2. To test the power supplies, power the unit with a 12V 2A source. PTC1 is a 1.6A thermal fuse which protects the unit from catastrophic damage. It is located next to test point TP2. If it is hot to the touch there is a short circuit or damaged component. This fault must be remedied before proceeding further.

The table below lists the voltages generated on the circuit board by the associated IC's. All voltages are measured relative to the ground pin (see figure 3). IC's or test points located on the bottom side of the circuit board are designated with an asterisk \*.

Voltage	Designator	IC P/N	Test Point
23.5± 0.5	U12	LT1370HV	C41(+)
5.0± 0.2	U14*	LM2675-5	C36(+)*
9.0±0.3	U13	LM2675-5	C51(+)
+3.3±0.1	U8*	LTC1877	C69/R45*
-3±0.5	U8*	LTC1877	C71(+)*

Voltages which are outside of the stated tolerance may indicate either a defective IC, a faulty passive component (capacitor, inductor, or diode), or an improper load. It is strongly that the factory service department or a designated PCS service representative perform board level repairs.

3. Null Adjustments. The following procedures are used to eliminate motor creeping when operating pressure is not applied to the joystick. The procedure has three parts: null adjustment for **joystick offset**, **digital motor offset**, and **analog mode offset**. The null adjustment for the joystick must always be performed first.

A digital voltmeter with 0.1mV resolution is required. Use small "grabber hooks" to make contact with the test pins.

- a. Remove the 4 screws securing the cover of the unit. Apply power using either a "Y" cable for connection to a digital motor, a cable for connection to a FIZ system, or a cable for a video lens.
- b. Secure the unit at a typical operating angle (30° to 45° typical).
- c. Turn the maximum speed control clockwise to "99".
- d. With nothing contacting the red joystick knob, measure the voltage between test points 3 and 4. Adjust VR2 to make the reading less than 0.20mV. This completes the **joystick offset adjustment**.
- e. Check for **joystick hysteresis** by momentarily applying pressure to the red knob in one direction and then releasing. After allowing 10 - 20s for the meter reading to stabilize, the reading should return to less than 1 mV. Repeat this but with pressure applied in the opposite direction. Again confirm that the reading is less than 1 mV. Excessive hysteresis can be caused by the joystick receiving a large mechanical shock.
- f. The next two steps are for adjusting the **digital motor offset**. Use a "Y" motor cable to power the control, but don't connect a motor.
- g. Press and hold simultaneously buttons Set and Lens Cal. This will put the bargraph display in a special mode that displays the digital offset. Adjust VR3 so that the bargraph shows two or fewer bars. The display will remain in this diagnostic mode for 10 – 20 seconds or until the power is recycled. This completes the digital motor offset calibration.
- h. The last step is for adjustment of the **analog mode offset**. Connect the control to a Video lens or the FIZ unit using an appropriate cable. Be sure that the sensitivity control is set to minimum ("0") as before. Find pins 7 and 8 of connector J1 on the circuit board (the brown and brown/white striped wires). See fig. 3.

Use fine probe tips on the voltmeter probes to measure the voltage difference between pins 7 and 8. Adjust VR3 until the voltage difference is less than 0.10mV. This completes the **analog mode offset** adjustment.

- i. VR4 is used to null out joystick asymmetry. It's setting should not be altered unless the joystick is replaced.
- v. Current Limit adjustment. The current limit adjustment pot VR1 determines the maximum motor torque both during calibration and normal operation. The operating torque is approximately 40% higher than the calibration torque.

The stall current through the motor is factory set to 0.90A . Turning VR1 anti-clockwise increases the maximum motor torque; each full turn of VR1 roughly corresponds to a 10% change.

fig. 4 DM1, DM1X, and DM2 digital motors



fig. 5 Micro Force with FIZ Hand Unit



## Digital Micro Force Controls and Accessory List

<u>Product Number</u>	<u>Description</u>
1210	Digital Micro Force 2 Control
1128	Auxiliary Power Cable 12V (4 pin XLR)
1129	Auxiliary Power Cable 24V (3 pin XLR PV polarity)
1130	Auxiliary Power Cable 24V (3 pin XLR Arri polarity)
1220	Y cable for 12V Arri Cameras
1221	Y cable for 24V Arri Cameras
1222	Y cable for Panavision Cameras
1225	Y cable for Aaton Cameras
1226	Y cable for Moviecam Cameras (2-pin Fischer)
1227	Y cable for Anton Bauer Power tap
1234	Extension Cable 25'
1234V	Extension Cable 25' for video lens only
1235	Extension Cable - custom length
1236	Canon Video Y cable 8-pin Tajimi-Anton Bauer power tap
1237	Fujinon Video Y cable 8-pin Tajimi-Anton Bauer power tap
1238	Canon Video Cable 20-pin Hirose
1240	Y Cable for Sony HD/Panasonic HD
1241	Canon Video Cable 12-pin Hirose
1258	Fujinon Video Cable 12-pin Hirose
4201	DM2 Digital Motor
4205	DM1X Digital Motor
4231	48 pitch zoom gear for Panavision lenses
4240	5.0m gear for Canon lenses
4241	.60m gear for Fujinon lenses
4301	Arri 19mm Swing Arm
4302	Arri/Panavision Swing Arm
4333	Moviecam/Arri Swing Arm
4320	Step Down Bushing 19mm/15mm Arri
4321	Step Down Bushing 19mm/.625" Panavision
1155	Articulating Pan Arm Bracket for Digital Micro Force and VF2