Digital Micro Force Manual

ver. 1.0

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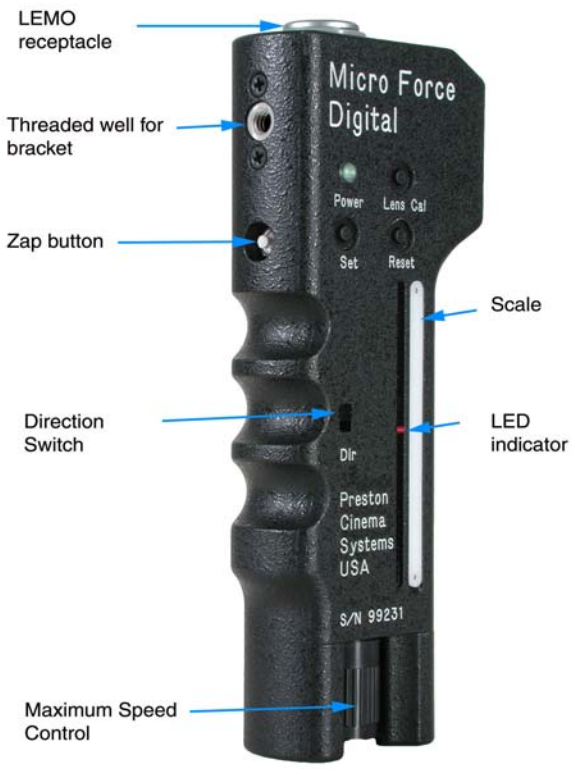

fig 1. Control switches and functional descriptions

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fig. 2 Control with Pan Arm Adapter accessory

Digital Micro Force

1. Introduction. The Digital Micro Force incorporates the same robust force sensor technology, which has made the Micro Force an industry standard. In addition it provides unique advantages made possible by digital technology: automatic lens calibration, electronic limit setting, and a bright led bargraph display of zoom position.

   The unit is machined from solid aluminum alloy. The rugged housing protects the control from mechanical abuse and assures years of reliable operation. A new ergometric design provides a rounded grip for comfortable all day use and also offers a convenient attachment point for its mating Pan Arm adapter.

   The unit can drive either the DM1 or DM2 digital motors. The units' 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 Micro Force to remotely control the camera run/stop or VTR functions respectively.

   The Digital Micro Force also provides the analog command signal for the zoom channel of the FI+Z system and controlling the internal servos of video lenses.

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 actual 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 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 .50 / .60 metric 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 Micro Force 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 bar graph indication will remain dark until this operation is completed.
    f. After finding the end stops of the lens, the motor stops and the bar graph indicator will light .
    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/ Sensitivity control** is located at the bottom of the control. The adjustment range is 10 turns of the clock dial with the setting of "10" corresponding to the maximum speed and sensitivity.
    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).
    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 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.

6. Troubleshooting Guide

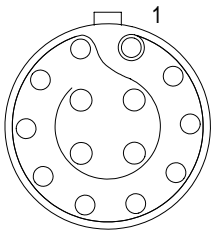
Problem	Action
a. Power light is off	Check power source. Is battery OK? Is power present at accessory socket? Check unit with auxiliary power cable. The thermal fuse may have tripped. Remove power for 1 minute.
b. Motor stops during calibration	Is the gear mesh too tight? Does the lens bind? Check that the motor bracket doesn't move and that post through the motor is tight.
c. Power light is on but the zoom motor doesn't move.	Is the motor jammed? Check operation with motor decoupled from lens gear. Press the reset button and recalibrate the lens. 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)

7. Technical Information and Service Guide

i. LEMO 14 pin-out.

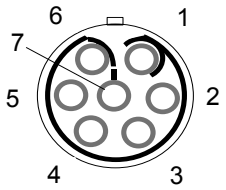
Type EGG2B314

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



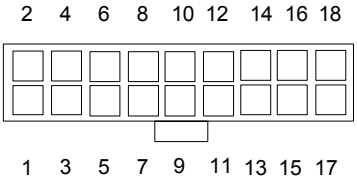
ii. DM-1, DM-2 LEMO pin-outs
LEMO type EGG1B307 (receptacle)

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. 18 pin Berg Housing (plug shown)

1. + Battery
2. - Battery
3. n/c
4. +speed pot
5. wiper speed pot
6. - speed pot
7. + joystick
8. joystick c.t.
9. - joystick
10. Video ref. In
11. Zoom Command out
12. Motor plugged
13. Encoder Channel B
14. Encoder Channel A
15. GND
16. +5V
17. Motor Drive A
18. Motor Drive B



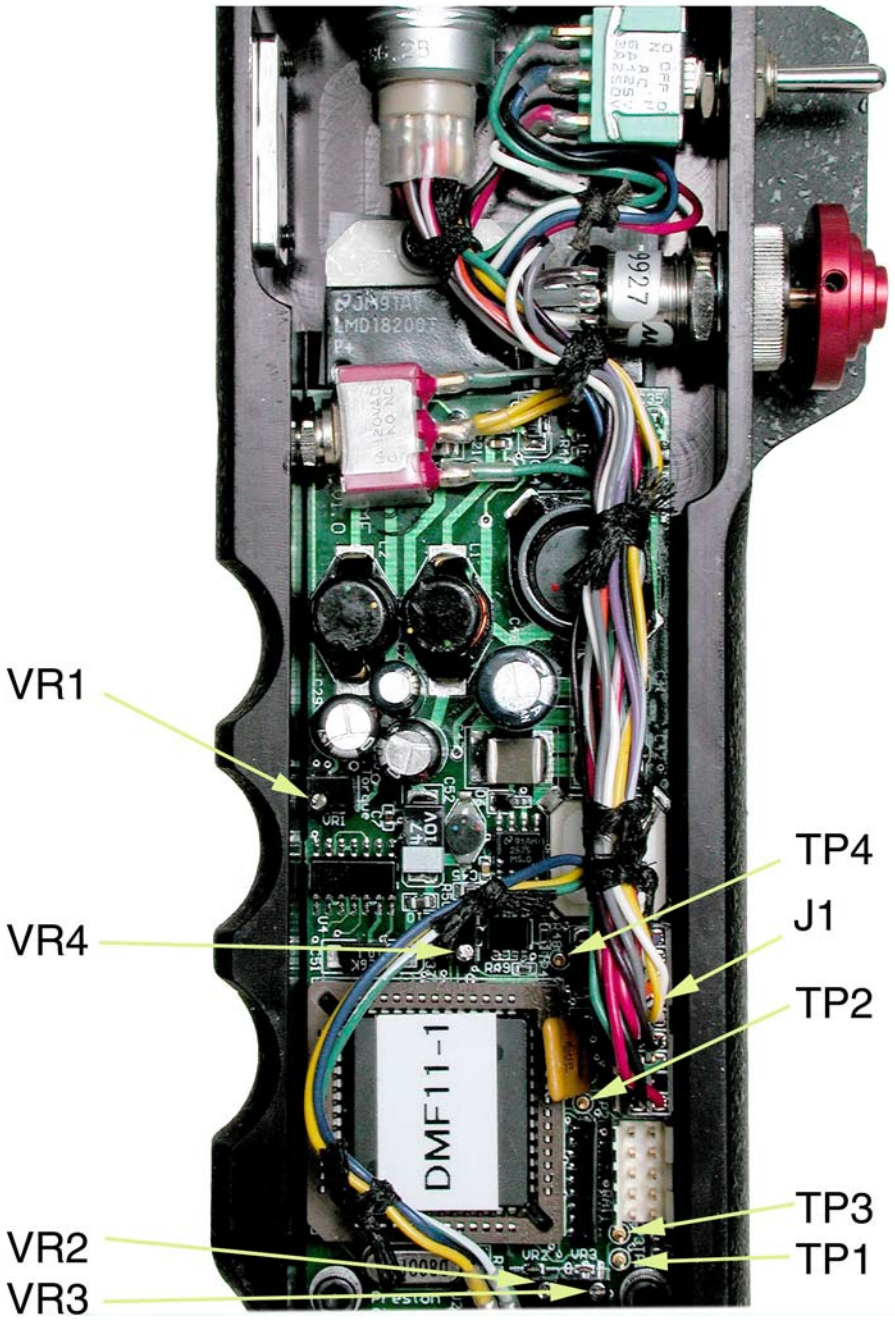


Fig.3 Circuit board showing test points and potentiometer locations.

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 three switching power supplies; controlled by IC's U13, U14, and U12. All three supplies are active when the Micro Force is driving a digital motor. They generate +5V, +9V, and +24V respectively. U12 acts as a voltage booster in that its output voltage is 24V for input voltages less than 22V, and its output voltage tracks the input voltage for voltages greater than 22V. When the unit 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 +24 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.

    a. Measure the voltage across capacitor C41 or C42 on the top side of the circuit board. (these are orange colored tantalum capacitors) The voltage should be 24V ± 0.5V.
    b. Measure the voltage across C51 on the top side of the board. It should read 9V ± .2V.
    c. Measure the voltage across C55 (4.7uF 35V) on the lid. The reading should be 5.0 ± .1V
    d. Typical current consumption is: 95mA with 12V input and 55mA with 24V input. In analog mode operation with the unit connected to either a video zoom lens or the FI+Z unit, the current consumption is 13mA.

3. Null Adjustments. The following procedures are used to eliminate r 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 "10" - for maximum sensitivity.

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 .10mV. 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 hysterisis 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 connect the digital motor. Do not attach it to a lens; instead establish the end limits by stopping it momentarily with your hand. Allow it to rotate at least 5 complete revolutions so as to easily observe small motor movements.
g. Use the joystick to position the motor roughly in the center of its rotation range (use the bargraph). This will allow the motor to rotate freely without hitting a limit. Connect the Voltmeter between TP1 and TP2. Rotate the sensitivity control to minimum - "0". Adjust VR3 until the motor just begins to creep. Write down the voltage reading. Now adjust VR3 in the opposite direction (count the number of turns) until the motor just begins to creep in the opposite direction. Find the difference between the two readings and use VR3 to make the voltage exactly halfway between. Alternatively, if a meter isn't available, VR3 can be adjusted halfway. This completes the **digital motor offset** adjustment.
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 10 and 11 of connector J1 on the circuit board (the brown and brown/white striped wires). See fig. 1.

   Use sharp probe tips on the voltmeter to measure the voltage difference between pins 10 and 11. Adjust VR4 until the voltage difference is less than 0.10mV. This completes the **analog mode offset** adjustment.

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 <u>through the motor</u> 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 and DM2 digital motors

fig. 5 Micro Force with FIZ Hand Unit

Digital Micro Force Controls and Accessory List

Product Number	Description
1200	Digital Micro Force Control
1128	Auxiliary Power Cable 12V (4 pin XLR)
1129	Auxiliary Power Cable 24V (3 pin XLR PV polarity)
1130	Y cable for 12V Arri Cameras
1220	Y cable for 24V Arri Cameras
1221	Y Cable for Panavision Cameras
1225	Y cable for Aaton Cameras
1226	Y cable for Moviecam Cameras (2-pin Fischer)
1227	Y cable for Moviecam Cameras (3-pin Fischer)
1225	Y cable for Anton Bauer Power tap
1231	Canon Video Cable
1232	Fujinon Video Cable
1233	Nikon Video Cable
1234	Extension Cable 25'
1235	Extension Cable - custom length
4200	DM1 Digital Motor
4201	DM2 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