

Model L20
Instruction Manual



Microprocessor based
pH, ORP, Temperature
Bench Top Meter

Electro-Chemical Devices, Inc.

1500 N. Kellogg Dr., Anaheim, CA 92807 USA

Telephone: +1-714-695-0051

www.ecdanalytical.com

Contents

General Introduction.....	1
Initial Inspection.....	2
Powering the Unit	2
Installing the Batteries	2
Display and Key Functions	3
A. Display.....	3
B. Keys.....	4
Operational Procedures	5
A. Buffer Set Selection	5
B. pH Calibration	5
a. ATC/Temp probe, pH-AUTOLOCK mode	5
b. Manual temperature compensation, pH-AUTOLOCK mode	6
c. ATC/Temp probe, pH NON-AUTOLOCK mode	7
d. Manual temperature compensation, pH NON-AUTOLOCK mode ..	8
C. pH Measurements	9
a. ATC/Temp probe, pH AUTOLOCK mode	9

b. Manual temperature compensation, pH-AUTOLOCK mode	9
c. ATC/Temp probe, pH NON-AUTOLOCK mode	10
d. Manual temperature compensation, pH NON-AUTOLOCK mode	10
D. Temperature Measure	10
E. mV Measurements.....	10
a. mV-AUTOLOCK mode.....	10
b. mV NON-AUTOLOCK mode	11
pH Calibration Buffer Table.....	12
Error Displays and troubleshooting	13
Specifications	14
Warranty	15

General Introduction

Thank you for selecting the Model L20 meter. The Model L20 is a precision tool that measures pH, mV, ORP or temperature—depending on the electrode you are using. A built-in microprocessor stores, calculates and compensates for all parameters related to pH determinations including pH electrode temperature characteristics, electrode slope deviations and buffer solutions.

This meter has a waterproof IP54 case. The mechanical keys are highly reliable with tactile and audio feedback. This meter is powered by (6) “AAA” alkaline batteries or with a UL approved AC adapter (Output 9VDC). The meter also displays a “BAT” message when the batteries are in need of replacement. Re-calibration is not required when power is restored.

The front of the meter has a large LCD that displays pH or mV and temperature simultaneously along with user prompts and mode indicators. The unit prompts the user through calibration and measurement procedures.

An AUTOLOCK feature for both pH and mV measurements enables the unit to automatically sense the end point and “LOCK” the display to indicate the end point value of a measurement. AUTOLOCK and user prompts help eliminate most errors in determining pH and mV values, resulting in precise, repeatable and error-free measurements. The Model L20 can also be used in non-AUTOLOCK mode.

The Model L20 is available with pH, ORP and ATC (Automatic Temperature Compensation) probes. Other features include single, dual or three point calibration, electrode offset recognition, electrode slope recognition; electrode efficiency display, built-in buffer coefficients, automatic or manual temperature compensation, long battery life, and 50/60Hz AC noise rejection. This meter is user-friendly, for field, industrial and laboratory applications.

Initial Inspection

Carefully unpack the unit and accessories. Inspect for damages made in shipment. If any damage is found, notify your ECD representative immediately. All packing materials should be saved until satisfactory operation is confirmed.

Powering the Unit

The L20 meter can be powered by an 115V or 230VAC adaptor as well as 6 “AAA” alkaline batteries. Check the label on the AC 3 adaptor supplied with the instrument to make sure that the AC line voltage is correct. If the wrong AC adaptor is supplied, notify your ECD representative immediately.

Installing the Batteries

The Model L20 pH meter is packaged with 6 “AAA” alkaline batteries required for operation. To insert the batteries into the meter, follow the procedure outlined below.

1. Use two hands to flip the buckles and battery cover to expose the battery compartment. (Figure 1)
2. Note the polarity and insert the batteries into the battery compartment correctly.
3. Replace the battery cover.

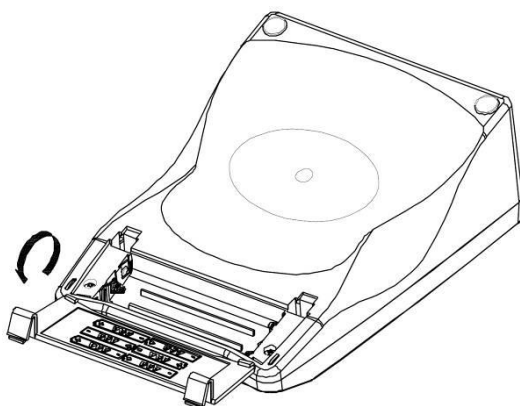


Figure 1

Display and Key Functions

A. Display

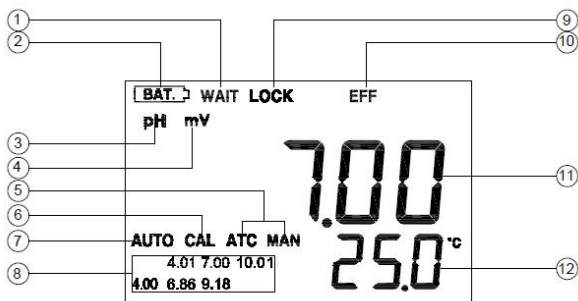



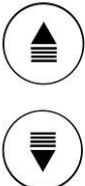
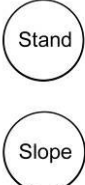



Figure 2

1. WAIT This will be displayed when the unit is still waiting for a stable reading or end point sensing.	7. AUTO AUTOLOCK mode indicator.
2. BAT Low Battery Indicator	8. Buffer Selection This indicator will flash if the unit is not yet calibrated. This indicator will remain lit-up if the unit has been calibrated.
3. pH Unit and mode indicators	9. LOCK This will indicate that the reading is frozen during AUTOLOCK mode.
4. mV Unit and mode indicators.	10. EFF This will be displayed if the user is viewing the efficiency of the electrode. It is recommended to use a new electrode when the efficiency value is less than 75%.
5. ATC/MAN ATC indicator will be displayed if a temperature probe is connected otherwise the MAN indicator will be displayed.	11. Main display For pH, mV and probe efficiency values
6. CAL This will be displayed when the unit enters into the calibration mode	12. Secondary Display For temperature in °C display

B. Keys

	<p>On/Off Press and hold this key for 5 seconds to power on and shut off the meter. Once the unit is power up, press the same key to turn on or off the backlight.</p>
	<p>Mode Selects display mode. Pressing this key changes the display sequentially to display pH-AUTO, mV-AUTO, pH and mV. The calibration values will not be affected by changing the display modes. In "pH calibration", press "Mode" key to exit the two point calibration mode.</p>
	<p>Clear It is used to clear the unit when error signal appears. It clears all calibration values stored in the internal memory. Under normal use the key will not be activated unless pressed and held for 2 seconds to prevent accidental erasing stored memory. When the "Clear" key is pressed, all segments of the LCD will be on. After about 2 seconds the unit will enter the pH-AUTO mode. The "AUTO" and "CAL" will be on and one of the buffer values will start to flash. This means that the unit must be calibrated.</p>
	<p>Up/Down Increases or decreases the displayed temperature value when in manual mode, buttons have no effect when in ATC mode.</p>
	<p>Stand/Slope The "Stand" and "Slope" keys are used for dual or three point pH calibration of the unit. Pressing and holding the Stand key while turning on the power, will change the buffer set to the other available buffer set.</p>
	<p>Mea. / Eff. The key is used to bring the unit out of the AUTO condition when operating in the pH-AUTOLOCK or mV-AUTOLOCK mode. Press and hold this key for 5 seconds, the LCD will display the efficiency of the electrode.</p>

Operational Procedures

A. Buffer Set Selection

The Model L20 meter has two buffer sets: 7.00, 4.01, 10.01pH and 6.86, 4.00, 9.18 pH. The meter is factory pre-set at 7.00, 4.01 and 10.01 pH. To change the buffer set, turn off the unit, then press and hold the **“Stand”** key while turning on the unit again.

[**Note:** There is no need to repeat this procedure every time the unit is power up unless one decides to change the buffer settings.]

B. pH Calibration

The Model L20 uses 2-point or 3-point calibration. The first point must be 6.86/7.00, and the second point can either be 4.00/4.01 or 9.18 / 10.01.

a. Calibration with an ATC/Temp probe in the pH-AUTOLOCK mode

1. Turn the unit on. Press **“Clear”** key for 2 seconds, all LCD elements will light up. The meter clears all calibration values stored in internal memory.
2. Connect the pH electrode to the BNC connector and the ATC/Temp probe to the ATC/Temp connector of the unit: **“ATC”** icon will light up. **“pH”** icon and **“AUTO”** icon light up. The buffer set icon will flash.
3. Rinse the pH and ATC/Temp probes in distilled water and immerse them in the first buffer solution (either 7.00 or 6.86). Allow temperature reading to stabilize, then press and hold **“Stand”** key for 5 seconds to calibrate. The **“WAIT”** icon will flash until the unit detects a stable reading. Once the unit calibrates the first point, the selected buffer remains lit up while the remaining two buffers start to flash. The unit is ready to be sloped at the second buffer.

[**Note:** If the first buffer solution is 7.00 or 6.86, at this moment, press the **“Mode”** key. The unit will exit the calibration mode. Single point calibration is complete. If the first buffer solution is 4.00, 4.01, 9.18 or 10.00, at this moment, the unit will automatically exit the calibration mode. Single point calibration is complete.]

4. Rinse the pH and ATC/Temp probe in distilled water and immerse them in the second buffer solution (either 4.00/4.01 or 9.18/10.01). Allow temperature reading to stabilize, then press **“Slope”** key to calibrate. The **“WAIT”** icon will flash until the unit detects a stable

reading. Once the unit calibrates the second point, the “SLOPE” icon will flash. The unit is ready to be sloped at the third buffer.

[**Note:** At this moment, press the “Mode” key, to exit the calibration mode. Dual point calibration is complete.]

5. Rinse the pH and ATC/Temp probe in distilled water and immerse them in the third buffer solution (either 9.18/10.01 or 4.00/4.01). Allow temperature reading to stabilize, then press “**Slope**” key to calibrate. The “WAIT” icon will flash until the unit detects a stable reading. Once the unit calibrates the third point and the unit will automatically exit the calibration mode. The three point calibration is complete.
6. The unit calculates and compensates for the pH electrode slope deviation corresponding to the values of the three calibration buffers. After calibration, press and hold “**Mea./Eff.**” key for about 5 seconds to display the new electrode efficiency.

b. Calibration with manual temperature compensation in the pH-AUTOLOCK mode

1. Turn the unit on. Press “**Clear**” key for 2 seconds, all LCD elements will light up. The meter clears all calibration values stored in internal memory.
2. Connect the pH electrode to the BNC connector of the unit, “MAN” icon will light up. “pH” icon and “AUTO” icon light up. The buffer set icon will flash.
3. Rinse the pH probes in distilled water and immerse it in the first buffer solution. Adjust the temperature reading to that of the first buffer using the “**up**” or “**down**” keys (0.0 to 60.0°C). Then press and hold the “**Stand**” key for 5 seconds to calibrate. The “WAIT” icon will flash until the unit detects a stable reading. Once the unit calibrates the first point, the selected buffer remains lit up while the remaining two buffers start to flash. The unit is ready to be sloped at the second buffer.

[**Note:** If the first buffer solution is 7.00 or 6.86, at this moment, Press the “**Mode**” key, the unit will exit the calibration mode. Single point calibration is complete.

If the first buffer solution is 4.00, 4.01, 9.18 or 10.00, at this moment, the unit will automatically exit the calibration mode. Single point calibration is complete.]

4. Repeat steps 4~6 of “**Calibration with an ATC/Temp probe in the pH-AUTOLOCK mode**” for the dual and three point calibration.

c. Calibration with an ATC/Temp probe in the pH NON-AUTOLOCK mode

1. Turn the unit on. Press “**Clear**” key for 2 seconds, all LCD elements will light up. The meter clears all calibration values stored in internal memory.
2. Connect the pH electrode to the BNC connector and the ATC/Temp probe to the ATC/Temp connector of the unit: “ATC” icon will light up. Press “**Mode**” key to select “pH” mode. “pH” icon is on. One of the buffer in the pre-selected buffer set will start to flash.
3. Rinse the pH and ATC/Temp probes in distilled water and immerse them in the first buffer solution. Allow temperature reading to stabilize, then press and hold “**Stand**” key for 5 seconds to calibrate, the unit immediately calibrates the first point, the selected buffer remains lit up while the remaining two buffers start to flash. The unit is ready to be sloped at the second buffer.

[**Note:** If the first buffer solution is 7.00 or 6.86, at this moment, Press the “Mode” key, the unit will exit the calibration mode. Single point calibration is complete.]

If the first buffer solution is 4.00, 4.01, 9.18 or 10.00, at this moment, the unit will automatically exit the calibration mode. Single point calibration is complete.]

4. Rinse the pH and ATC/Temp probe in distilled water and immerse them in the second buffer solution (either 4.00/4.01 or 9.18/10.01). Allow temperature reading to stabilize, then press “**Slope**” key to calibrate. Once the unit calibrates the second point, the “SLOPE” icon will flash. The unit is ready to be sloped at the third buffer.

[**Note:** At this moment, press the “**Mode**” key, to exit the calibration mode. Dual point calibration is complete.]

5. Rinse the pH and ATC/Temp probe in distilled water and immerse them in the third buffer solution (either 9.18/10.01 or 4.00/4.01).

Allow temperature reading to stabilize, then press **"Slope"** key to calibrate. Once the unit calibrates the third point and the unit will automatically exit the calibration mode. The three point calibration is complete.

6. The unit calculates and compensates for the pH electrode slope deviation corresponding to the values of the three calibration buffers. After calibration, press and hold **"Mea./Eff."** key for about 5 seconds to display the new electrode efficiency.

d. Calibration with manual temperature compensation in the pH NON-AUTOLOCK mode

1. Turn the unit on. Press **"Clear"** key for 2 seconds, all LCD elements will light up. The meter clears all calibration values stored in internal memory.
2. Connect the pH electrode to the BNC connector of the unit, **"MAN"** icon will light up. Press **"Mode"** key until **"pH"** icon is on. The buffer set icon will flash
3. Rinse the pH probes in distilled water and immerse it in the first buffer solution. Adjust the temperature reading to that of the first buffer using the **"up"** or **"down"** keys (0.0 to 60.0°C) before pressing **"Stand"** key. Then press and hold **"Stand"** key for 5 seconds to calibrate. The unit immediately calibrates the first point, the selected buffer remains lit up while the remaining two buffers start to flash. The unit is ready to be sloped at the second buffer.

[**Note:** If the first buffer solution is 7.00 or 6.86, at this moment, Press the **"Mode"** key, the unit will exit the calibration mode. Single point calibration is complete. If the first buffer solution is 4.00, 4.01, 9.18 or 10.00, at this moment, the unit will immediately exit the calibration mode. Single point calibration is complete.]

4. Repeat steps 4~6 of **"Calibration with an ATC/Temp probe in the pH NON-AUTOLOCK mode"** for dual and three point calibration.

C. pH Measurements

To take pH measurements, the pre-selected buffer solution set must lit up, indicating the unit is Single point or dual-point or three-point calibrated and ready for measurements. If buffer solution set flashes, perform a pH calibration before taking measurements.

a. Measurement with an ATC/Temp probe in the pH AUTOLOCK mode

1. Connect the pH electrode to the BNC connector and the ATC/Temp probe to the ATC/Temp connector of the unit. The “ATC” icon will light up.
2. Press “**Mode**” key until “pH” icon and “AUTO” icon light up.
3. Rinse the pH electrode and ATC/temp probe with distilled water and immerse in the sample to be measured. Remove any air bubbles trapped around the probe by shaking or stirring the probe.
4. Press the “**Mea.**” key. The “WAIT” icon will start flashing. The unit is waiting for a stable reading. The display will track the pH value as sensed by the pH electrode and the ATC/Temp probe.
5. When the “WAIT” icon disappears, the reading is then “LOCK” and will not respond to further changes from the sample. The pH value shown is the pH value of the sample at the displayed sample temperature.

[**Note:** For samples that are inherently unstable, the unit will not AUTOLOCK. In these cases, use the pH NON- AUTOLOCK mode for measurements.]

b. Measurement with manual temperature compensation in the pH-AUTOLOCK mode

1. Connect the pH electrode to the BNC connector of the unit. The “MAN” icon will lit up. Set unit to display the sample temperature by pressing the up and down keys (0.0 to 100°C).
2. Repeat steps 2~5 of “**Measurement with an ATC/Temp probe in the pH- AUTOLOCK mode**”.

c. Measurement with an ATC/Temp probe in the pH NON-AUTOLOCK mode

1. Connect the pH electrode to the BNC connector and the ATC/Temp probe to the ATC/Temp connector of the unit. The “ATC” icon will light up.
2. Press “**Mode**” key until “pH” icon lights up.
3. Rinse the pH electrode and ATC/temp probe with distilled water and immerse in the sample to be measured.
4. Allow sufficient time for the display to stabilize. The instrument will display the pH value of the sample at the displayed sample temperature.

d. Measurement with manual temperature compensation in the pH NON-AUTOLOCK mode

1. Connect the pH electrode to the BNC connector of the unit. The “MAN” icon will light up.
2. Repeat steps 2~4 of “**Measurement with an ATC/Temp probe in the pH NON-AUTOLOCK mode**”.

D. Temperature Measure

The L20 can measure temperature independently with the ATC/temp probe without using the pH electrode. Place the ATC/temp probe in the sample. The unit will display the measured temperature.

E. mV Measurements

a. Measurement in the mV-AUTOLOCK mode

1. Connect the optional combination ORP electrode to the BNC connector of the unit.
2. Press “**Mode**” key until “mV” icon and “AUTO” icon lit up.
3. Rinse electrode with distilled water and immerse it in sample to be measured.
4. Press the “**Mea.**” key. The “WAIT” icon will start flashing. The unit is waiting for a stable reading. The display will track the mV value as sensed by the ORP electrode

5. When the “WAIT” icon disappears, the reading is then “LOCK” and will not respond to further changes from the sample. The mV value is the sample reading.

[**Note:** For samples that are inherently unstable, the unit will not AUTOLOCK. In this case, use the pH NON- AUTOLOCK mode for measurements.]

b. Measurement in the mV NON-AUTOLOCK mode

1. Connect the optional combination ORP electrode to the BNC connector of the unit.
2. Press “**Mode**” key until “mV” icon lights up.
3. Rinse electrode with distilled water and immerse it in sample to be measured.
4. Allow sufficient time for the display to stabilize. The instrument will display the mV value of the sample.

pH Calibration Buffer Table

The temperature coefficient of pH calibration buffers 4.01, 6.86, 7.00, 9.18 and 10.01 are stored inside the instrument. The buffers used to calibrate the instrument must exhibit the same temperature characteristics as the stored values.

Temperature coefficient of the pH buffers

°C	4.00	6.86	9.18	4.01	7.00	10.01
0	4.01	6.98	9.46	4.01	7.11	10.32
5	4.00	6.95	9.39	4.01	7.08	10.25
10	4.00	6.92	9.33	4.00	7.06	10.18
15	4.00	6.90	9.28	4.00	7.03	10.12
20	4.00	6.88	9.23	4.00	7.01	10.06
25	4.00	6.86	9.18	4.01	7.00	10.01
30	4.01	6.85	9.14	4.01	6.98	9.97
35	4.02	6.84	9.10	4.02	6.98	9.93
40	4.03	6.84	9.07	4.03	6.97	9.89
45	4.04	6.83	9.04	4.04	6.97	9.86
50	4.06	6.83	9.02	4.06	6.97	9.83
55	4.07	6.83	8.99	4.08	6.97	9.80
60	4.09	6.84	8.97	4.10	6.98	9.78

[Note: The actual reading of the instrument can differ from the values shown be ± 0.01 pH.]

Error Displays and troubleshooting

Main Display	Possible Causes	Corrective Actions
"Er1"	<ul style="list-style-type: none"> • "Stand" was pressed before the electrode and ATC/Temp probe settled to within +/- 1.5 pH of the buffer value. • pH electrode offset is greater / less than +/-1.5 pH. • pH electrode is faulty. 	<ul style="list-style-type: none"> • Press "Clear" key, allow sufficient time for the electrode and ATC/Temp probe to stabilize, re-press "Stand" key to start the calibration procedure. • Replace the buffer and /or the pH electrode. Press "Clear" key to recalibrate meter. • Replace electrode.
"Er2"	<ul style="list-style-type: none"> • "Slope" was pressed before the electrode and ATC/Temp probe settled to within 30% of the buffer value. • Buffer 4.00, 4.01, 9.18 and 10.01 is not correct. • pH electrode slope is off by more than 30% of ideal slope. 	<ul style="list-style-type: none"> • Allow sufficient time for the electrode and ATC/Temp probe to stabilize, re-press "Slope" key to continue the calibration procedure. • Check if the correct buffer is used. • Replace the buffer and /or the pH electrode. Press "Clear" key to recalibrate meter.
"Er3"	Temperature is out of the 0.0 to 60.0°C range.	Bring the buffer temperature within range.
"over" Or "undr"	<ul style="list-style-type: none"> • Measured pH is out of the 0.00 to 14.00 pH range. • Measured mV is out of the 1999.9 to 1999.9 mV range. • Measured temperature is out of the 0.0 to 100.0°C range. 	<ul style="list-style-type: none"> • Bring sample pH into the correct measuring range. • Bring sample ORP into the correct measuring range. • Bring sample temperature into the correct measuring range.

[**Note:** If the meter still does not perform normally after the above measures are taken, call ECD representative.]

Specifications

Display	Range	Resolution	Accuracy
pH	0.00 to 14.00 pH	0.01 pH	$\pm 0.1\%$ pH
mV	-1999.9 to 1999.9 mV	0.1 mV	$\pm 0.1\%/\pm 0.1\%$ mV
Temperature	32 to 212°F (0.0°C to 100.0 °C)	32.18° F (0.1 °C)	$\pm 32.36^\circ\text{F}$ (0.2 °C)

pH buffer recognition	pH 7.00, 4.01, 10.01 or pH 6.86, 4.00, 9.18
pH Temperature compensation	AUTO/MAN 32 to 212°F (0.0°C to 100.0 °C)
pH Buffer Temperature range	0°C to 60.0°C
pH Electrode Offset recognition	± 100 mV at pH 7.00 or $+108.3/-91.7$ mV at pH 6.86
pH Electrode Slope recognition	$\pm 30\%$ at pH 4.00, 4.01, 9.18 and 10.01
Input Impedance	$>10^{12} \Omega$
Temperature sensor	Thermistor, 10 k Ω at 77°F (25°C)
Power	Six “AAA” Batteries
Calibration Back-up	EEPROM
Audio Feedback	All Touch Keys
End Point Sensing & Hold	Yes
LCD Display	3 1/2" x 2 1/4"
Ambient Temperature	32 to 122°F (0 to 50 °C)
Relative Humidity	up to 90%
Case	IP54 watertight case
Dimensions	5.9" x 8" x 2.8" (150mm x 203mm x 72mm)
Weight	17.8 oz. (504 g) (Batteries included)

Warranty

Electro-Chemical Devices, Inc. (ECD) warrants all products it manufactures to be free from defect in materials and factory workmanship, and agrees to repair or replace any product that fails to perform, as specified, within one (1) year after date of shipment. This warranty shall not apply to any product that has been:

1. Subjected to misuse, negligence or accident;
2. Connected, installed, adjusted or otherwise used not in accordance with the instructions furnished by ECD;
3. Repaired, modified or altered by persons not authorized by ECD, resulting in injury to the performance, stability or reliability of the product.

This warranty is in lieu of any other warranty, expressed or implied. ECD reserves the right to make changes in the design or construction of its products at any time, without prior notification, and without incurring any obligation to make any changes in previously delivered products.

Seller's sole liabilities and the buyer's sole remedies under this agreement shall be limited to a refund in the purchase price, or at ECD's discretion, to the repair or replacement of any product that proves, upon ECD's examination, to be defective, when returned to the factory, transportation prepaid by the buyer, within one (1) year of the product's original shipment date. Seller shall not be liable for damages consequential or incidental to defects in any product, for failure of delivery in whole or in part, for injuries resulting from its use, or for any other cause.

This warranty and the writing attached constitute the full understanding of seller and the buyer, and no terms, conditions, understanding, or agreement purporting to modify or vary the terms hereof shall be binding unless hereafter made in writing and signed by an authorized official of Electro-Chemical Devices, Inc.

This warranty does not cover pH, ORP or Specific Ion measurement, reference or combination electrodes or electrode cartridges that have been commissioned in service.

If service or repair is required, please obtain the serial number(s) or sales order number of the product(s) in question and contact ECD's Service Department at: +1-800-729-1333 (USA/Canada) or +1-714-695-0051.



ELECTRO-CHEMICAL DEVICES

1500 N. Kellogg Dr.

Anaheim, CA 92807 USA

Phone +1-714-695-0051

www.ecdanalytical.com

E0219