Model 526

DC Source/Calibrator
100nVdc to ±111.1110Vdc



Operating Manual

Service and Warranty

Krohn-Hite Instruments are designed and manufactured in accordance with sound engineering practices and should give long trouble-free service under normal operating conditions. If your instrument fails to provide satisfactory service and you are unable to locate the source of trouble, contact our Service Department at (508) 580-1660, giving all the information available concerning the failure.

DO NOT return the instrument without our written or verbal authorization to do so. After contacting us, we will issue a Return Authorization Number which should be referenced on the packing slip and purchase order. In most cases, we will be able to supply you with the information necessary to repair the instrument, avoiding any transportation problems and costs. When it becomes necessary to return the instrument to the factory, kindly pack it carefully and ship it to us prepaid.

All Krohn-Hite products are warranted against defective materials and workmanship. This warranty applies for a period of one year from the date of delivery to the Original Purchaser. Any instrument that is found within the one year warranty period not to meet these standards, will be repaired or replaced. This warranty does not apply to fuses or batteries. No other warranty is expressed or implied.

Krohn-Hite Corporation reserves the right to make design changes at any time without incurring any obligation to incorporate these changes in instruments previously purchased.

Modifications to this instrument must not be made without the written consent of an authorized employee of Krohn-Hite Corporation.

Model 526

Precision DC Source/Calibrator

Operating Manual



Copyright © 2021. All rights reserved.

Contents of this publication may not be reproduced in any form without the written permission of Krohn-Hite Corporation.

Revision 3.6, Published 111721, Printed in U.S.A.

15 Jonathan Drive, Unit 4, Brockton, MA 02301-5566
Tel: (508) 580-1660; Fax: (508) 583-8989
sales@Krohn-hite.com; www.krohn-hite.com

Table of Contents

SECTION 1
GENERAL DESCRIPTION AND SPECIFICATIONS

1.1 Introduction 1-1

1.2 Specifications 1-2

SECTION 2
OPERATION

2.1 Introduction 2-1

2.2 Selecting Line Voltage 2-1

2.3 Placement and Rack Mounting 2-3

2.4 Quick Start 2-3

2.4.1 526 Tones 2-3

2.4.2 LOCAL Key 2-4

2.4.3 SELECTOR Knob 2-4

2.4.4 Setting a Voltage/Current 2-4

2.4.4.1 Decade Controls 2-4

2.4.5 Selecting a Range 2-4

2.4.6 Recalling Memory Set-Ups 2-5

2.4.7 Saving Set-Ups into Memory 2-5

2.4.8 Front Panel Output Terminals 2-6

2.4.8.1 HV Led 2-6

2.4.8.2 Wire Connections 2-6

2.4.9 Rear Panel Connectors 2-7

2.4.9.1 IEEE-488Connector 2-7

2.4.9.2 Optional LAN Connector 2-7

2.4.9.3 Power Entry Module 2-7

2.4.9.4 Rear Panel Output Connector and Mating Connector 2-8

2.4.9.5 Chassis Ground/Safety Ground 2-8

SECTION 2 (continued)
OPERATION

2.5 Front Panel Controls 2-8
2.5.1 Membrane Keys 2-8
2.5.1.1 [ENTER/STORE] Key 2-8
2.5.1.2 [RECALL] Key 2-9
2.5.1.3 [EDIT] Key 2-9
2.5.1.4 [LOCAL] Key 2-9
2.5.1.5 [+/-] POLARITY Key 2-10
2.5.1.6 [DOWN] and [UP] RANGE Keys 2-10
2.5.1.7 [VOLTS/MILLI AMP] Key 2-10
2.5.1.8 [CROWBAR] Key 2-11
2.5.1.9 [2WSENSE4W] Key 2-11
2.5.1.10 [UPDATEOUTPUT] Key 2-11
2.5.1.11 [MENU] Key 2-11

2.6 Display Information 2-12
2.6.1 Mode 2-12
2.6.2 Memory 2-13
2.6.3 Comm 2-13
2.6.4 Output Limits (V-mA) 2-13
2.6.5 Compliance Limits (VOLTS) 2-13
2.6.6 Sense Wires 2-14
2.6.7 Output Settings 2-14
2.6.8 Output 2-14

2.7 Menu and Selector Knob Control 2-14
2.7.1 Menu 1 - View Set-Up 2-15
2.7.1.1 Port Setting View 2-15
2.7.1.2 Voltage Limits View 2-16
2.7.1.3 Current Limit View 2-16
2.7.1.4 Compliance Voltage View 2-16
2.7.1.5 Power On Sequence View 2-16
2.7.1.6 Full or Partial Display View 2-17
2.7.1.7 Pass Thru Zero View 2-17
2.7.1.8 Remote Protocol View 2-17
2.7.1.9 Exiting To Main Level 2-18
2.7.1.10 Exiting Menu and Returning To Local Operation 2-18
2.7.2 Menu 2 - Port Selection 2-18

SECTION 2 (continued)

OPERATION

2.7.2.1 IEEE-488(GPIB) 2-19
2.7.2.2 LAN(Optional) 2-20
2.7.3 Menu 3 - V Output Limit 2-20
2.7.4 Menu 4 I Output Limit 2-22
2.7.5 Menu 5 V Compliance Limit (Fail Safe) 2-23
2.7.5.1 Changing V Compliance Limit 2-23
2.7.6 Menu 6 - Power-On Set-Up 2-24
2.7.6.1 Changing Power-On Set-Up Setting 2-25
2.7.7 Menu 7 - Display Area 2-26
2.7.7.1 Changing Display Area Setting 2-26
2.7.8 Menu 8 - Pass Thru Zero 2-27
2.7.8.1 Changing Pass Thru Zero Setting 2-27
2.7.9 Menu 9 - CLR User Memory 2-28
2.7.9.1 Clearing User Memory 2-28
2.7.10 Menu 10 - Remote Protocol 2-28
2.7.11 Changing Remote Protocol Setting 2-29
2.8 Overloading 2-29

SECTION 3

526 (STD) GPIB PROGRAMMING

3.1 Introduction 3-1
3.2 Krohn-Hite (Std) Programming Protocols 3-1
3.3 IEEE-488 (GPIB) Programming 3-2
3.3.1 Interface Capabilities 3-2
3.3.2 Setting The Instrument's Address 3-2
3.3.3 Interface Messages 3-2
3.3.3.1 "MLA" – My Listen Address 3-2
3.3.3.2 "MTA"- My Talk Address 3-2
3.3.3.3 "UNL" Unlisten 3-2
3.3.3.4 "IFC" Interface Clear 3-2
3.3.3.5 "Power-On" Clear 3-2
3.3.4 Group Commands 3-3
3.3.5 Output Data Byte String Format 3-4

SECTION 3 (continued)

526 (STD) GPIB PROGRAMMING

3.3.5.1 Examples of Data Strings/Output Results 3-5
3.3.6 Talk Enable Modes 3-5
3.3.7 C or c (Compliance Limit) 3-5
3.3.8 *RST or *rst (Power-Up Reset) 3-5
3.3.9 S or s (Status) 3-5
3.3.10 M or m (Set Memory) 3-8
3.3.11 L or l (Output Limit) 3-8
3.3.12 *IDN? or *idn? 3-8
3.3.13 ? (What's Wrong Query) 3-8
3.3.14 "What's Wrong" Request 3-8
3.3.15 Programming Examples 3-9

SECTION 4

MODEL 522 GPIB PROGRAMMING

4.1 Introduction 4-1

4.2 IEEE-488 Programming Protocol 4-1

4.2.1 Interface Messages 4-2
4.2.2 Groups of Commands 4-2
4.2.3 Talk Enable Modes 4-2
4.2.4 Responses 4-3
4.2.5 Data Byte String Format 4-3
4.2.6 What's wrong request, ("?") 4-4
4.2.7 Programming 4-4
4.2.8 IEEE-488 Addressing 4-5

SECTION 5

MODEL 8200 GPIB PROGRAMMING

5.1 Analogic/Data Precision Protocol 5-1

5.1.1 8200 Protocol Programming Examples 5-2
5.1.2 Address Setting 5-3
5.1.3 2-Wire/4-Wire Operation 5-3

SECTION 6
LAN (LOCAL AREA NETWORK) OPERATION

6.1 Introduction 6-1

6.2 Local Area Networks 6-1

6.2.1 Site LANs and Private LANs 6-1

6.2.2 Connecting Through a Network 6-1

6.2.3 Connecting Directly to the Model 526 (no network) 6-1

6.2.4 How to Find the Current IP Address 6-1

6.2.5 Setting a Fixed IP Address 6-3

6.2.6 LAN and HyperTerminal Setup 6-6

6.2.6.1 How to Set-Up and Run Windows® Hyper Terminal 6-6

SECTION 7
INCOMING ACCEPTANCE

7.1 Introduction 7-1

7.2 Warm-Up Time 7-1

7.3 Required Test Equipment 7-1

7.4 Preliminary Set-Up 7-1

7.5 Verification Procedure 7-2

7.5.1 Output Voltage Checks 7-2

7.5.2 Output Current Checks (using PCR100 Precision Resistor) 7-3

Warranty, Service and Safety

Krohn-Hite Instruments are designed and manufactured in accordance with sound engineering practices and should give long trouble-free service under normal operating conditions. If your instrument fails to provide satisfactory service and you are unable to locate the source of trouble, contact our Service Department at (508) 580-1660, giving all the information available concerning the failure.

DO NOT return the instrument without our written or verbal authorization. When contacting us, we will issue a Return Authorization Number that should be referenced on the packing slip and purchase order. In most cases, we will be able to supply you with the information necessary to repair the instrument, avoiding any transportation problems and costs. When it becomes necessary to return the instrument to the factory, kindly pack the instrument carefully and ship it to us prepaid.

All Krohn-Hite products are warranted against defective materials and workmanship. This warranty applies for a period of one year from the date of delivery, to the Original Purchaser. Any instrument that is found within the one-year warranty period not to meet these standards will be repaired or replaced. This warranty does not apply to fuses or batteries. No other warranty is expressed or implied.

Krohn-Hite Corporation reserves the right to make design changes at any time without incurring any obligation to incorporate these changes in instruments previously purchased.

Modifications to this instrument must not be made without the written consent of an authorized employee of Krohn-Hite Corp.

Claims

Immediately upon arrival, purchaser shall check the packing container against the enclosed packing list and shall, within thirty days of arrival, give Krohn-Hite notice of shortages or any non-conformity with the terms of the order.

The purchaser assumes all risk of loss or damage to instrument upon delivery by Krohn-Hite to the carrier. If an instrument is damaged in transit, ***purchaser must file all claims for damage with the carrier*** to obtain compensation. Upon request by purchaser, Krohn-Hite will submit an estimate of cost to repair shipment damage.

SAFETY ISSUES

Warning

HIGH VOLTAGE is used in the operation of this instrument. LETHAL voltages may be present on the output terminals. Please observe all safety precautions when operating this instrument.

Power Source

The Model 526 is intended to operate from a 105V to 130V or 210V to 260V ac rms source. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Proper Fuse

To avoid damage to the Model 526 or to prevent a fire hazard, use the correct fuse for the line voltage selected. Proper fuse requirement is screened on the rear panel of the instrument above the power connector.

The Model 526 has been designed, tested and supplied in a safe condition. The following general safety precautions must be observed during all phases of operation, service, and repair. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of this instrument. Krohn-Hite assumes no liability for the customer's failure to comply with these requirements.

This manual contains information and warnings that must be observed to keep the instrument in a safe condition and ensure safe operation. Operation or service in conditions or in a manner other than specified could compromise safety. For the correct and safe use of this instrument, operating and service personnel must follow generally accepted safety procedures.

To avoid injury or fire hazard, do not switch on the instrument if it is damaged or suspected to be faulty. Do not use the instrument in damp, wet, condensing, dusty or explosive gas environments.

Whenever it is likely that safety protection has been impaired, make the instrument inoperative and secure against any unintended operation, and then inform qualified personnel. Safety protection is likely to be impaired if, for example, the instrument shows visible damage, or fails to operate normally.

Ground The Instrument

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. Any interruption of the protective ground conductor inside or outside the instrument is likely to make the instrument dangerous. Intentional interruption is prohibited.

Protective Earth Ground

Protective earth symbol located on the inside rear chassis near the AC line filter module designate the point at which the safety earth system is attached to the chassis. The symbol must not be altered or removed. The safety earth wires (green/yellow) must never be disconnected. The safety earth ground wires (green/yellow) connecting the module must make direct contact with the chassis.

The following are symbols used on the chassis of the 526:

 ---- Chassis Protective Ground

 ---- AC (Alternating Current)

 ---- Conforms to European Union Directives

 ---- Important Information, Refer to the Manual

 ---- Caution, Risk of Electric Shock

Do Not Operate In An Explosive Area

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Keep Away From Live Circuits

Operating personnel must not remove instrument covers. Qualified maintenance personnel must make component replacement and internal adjustments. Under certain conditions, dangerous voltages may exist. To avoid injuries, always disconnect input voltages before removing the covers.

Do Not Substitute Parts or Modify Instrument

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modifications. Return the unit to the Krohn-Hite Service Department to modify or repair the instrument to ensure that safety features are maintained.

Do Not Operate a Damaged Instrument

Whenever it is possible that the safety protection features built into this instrument have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE the POWER and do not use the instrument until safe operation can be verified by service-trained personnel. If necessary, return the instrument to the Krohn-Hite Service Department for service and repair to ensure that the safety features are maintained.

Do Not Remove Cover

To avoid personal injury, do not remove the covers of the Model 526. There are no user-serviceable parts inside the instrument, so there is no reason for any user to remove the covers of this instrument.

Unpacking and Inspection

The Model 526 has been shipped in a container designed to prevent any damage from occurring during shipping. Inspect the 526 carefully for damage, and immediately report any damage to the shipper.

If you need to return the 526 for any reason, use the original container if possible. If not, you can order a new container from Krohn-Hite Corporation at (508) 580-1660 indicating the model and serial number.



Figure 1 *Model 526 Precision DC Source/Calibrator*

SECTION 1

General Description and Specifications

1.1 Introduction

The Krohn-Hite Model 526 Precision DC Voltage/Current Source/Calibrator is a highly stable and repeatable DC voltage and DC current source providing N.I.S.T. traceable voltages and currents for use in production, calibration labs, QA and QC departments, design labs, or any place where an accurate voltage and current source is needed.

The 526 provides accurate voltages from ±100nVdc to ±111.1110Vdc to within 20ppm for 1 year, and precise currents from ±10nA to ±111.1110mA to within 50ppm for 1 year. It is an extremely quiet source with <6µVrms of noise measured over a 10Hz to 100kHz bandwidth.

Decade Control

Microprocessor assisted decade control allows for continual use of one decade with full carry and borrow capability to and from all more significant decades for easier use and convenient manual operation.
Monotonic and linear A/D measurements can be made at any resolution using only one decade control.

Display and Front Panel Controls

A user friendly 2-line 40-character display and six front panel decade switches with full carry and borrow, allow for fast accurate voltage and current settings. Output settings can be modified using the front panel decade switches and the range keys. Output 2-wire, 4-wire operation is accomplished with one keystroke or over GPIB/LAN. A crowbar function places the output in a safe mode when desired. The 526 output can be set to 0 volts, allowing the output sense to maintain a true 4-wire low impedance output.

Ranges and Resolution

The 526 provides four voltage ranges of 100mV, 1V, 10V and 100V with a resolution of 100nV, 1µV, 10µV and 100µV respectively. Two current ranges provide 10mA and 100mA with a resolution of 10nA and 100nA respectively.

Non-Volatile Memory

Up to 32 storage locations are provided with the 526, that can be recalled at any time.

Voltage and Current Limits

Selecting voltage and current limits to prevent users from damaging sensitive circuitry or devices under test may be set from the front panel from ±0V to ±112V or 1mA to 112mA.

Output Voltage or Current Compliance Limits

A hardware fail safe compliance limits can be set in the Model 526. Settable limits are: 120V, 36V, 26V or 16V.

Remote Control

The 526 provides for GPIB and LAN (optional) remote control. Rear panel connectors are provided that allow connection to a computer. Programming Krohn-Hite and Analogic/DP 8200 protocols are built into the firmware, allowing the 526 to be used in any system with the older Model 521/522 and Analogic/DP Model 8200.

Applications

The 526 is well suited for a variety of applications such as: the design, check and calibration of high speed, high resolution, A/D converters; design and certification of high speed, data logging and process control systems; calibration of digital voltmeters and multimeters; as an "IMBEDDED STANDARD" and/or simulator; design, testing, simulation and certification of thermocouples, strain gages and transducer instrumentation. It is also a replacement for the Analogic Model 8200.

1.2 Specifications

1.2.1 Voltage Mode Specifications

Specifications apply at 23ºC ±1ºC, <70% relative humidity.

Range	Full Scale	Resolution	Current (dc)	Zo (ohms)
100mVdc	±111.1110mVdc	100nVdc	100mA	20µ
1.0Vdc	±1.111110Vdc	1µVdc		
10Vdc	±11.11110Vdc	10µVdc		
100Vdc	±111.1110Vdc	100µVdc		
Short Circuit Current: 200mA max				

Range	Full Scale	Absolute Accuracy ±(ppm of setting + µV)
		1Year
100mVdc	±111.1110mVdc	20 + 3
1.0Vdc	±1.111110Vdc	20 + 5
10Vdc	±11.11110Vdc	20 + 52
100Vdc	±111.1110Vdc	20 + 500

Range	24 Hour Stability * ±(ppm of setting + µV)
* 24 hour stability applies at 23ºC, ±1ºC	
100mVdc	±3 + 1.5
1Vdc	±3 + 1.5
10Vdc	±3 + 10
100Vdc	±3 + 100

Temperature Coefficient: 18ºC to 28ºC, ±5ppm of setting, ±1ppm of range/ºC; operating limit, ±10ppm of setting, ±2ppm of range/ºC.

Settling Times: 100mV, 1V and 10V range, 2ms; 100V range, 15ms; range changes, 35ms.

Line Regulation: ±2ppm of setting for a 10% line fluctuation.

Load Regulation 4-Wire operation: <±2ppm + 1µV of setting from no load to 100mA full load.
Measurements must be made at sense lead connection point to the load.

Noise and Ripple (rms):

Range	Bandwidth	
	0.1Hz to 0Hz	10Hz to 100kHz
100mVdc	2µVp-p	6µVrms
1Vdc	2µVp-p	10µVrms
10Vdc	4µVp-p	20µVrms
100V	40µVp-p	100µVrms

1.2.2 Current Mode Specifications

Range	Full Scale	Absolute Accuracy ±(ppm of setting + nA)	
		1Year	
10mAdc	±11.11110mAdc	50 + 50	
100mAdc	±111.1110mAdc	50 + 200	
Range	**Full Scale**	**Resolution**	**Voltage Compliance**
10mAdc	±11.11110mAdc	10nAdc	100Vdc
100mAdc	±111.1110mAdc	100nAdc	100Vdc

Noise and Ripple (rms):

Range	Bandwidth	
	0.1Hz to 10Hz	10Hz to 100kHz
10mAdc	25nAp-p	150nArms
100mAdc	100nAp-p	300nArms

Temperature Coefficient: 18ºC to 28ºC, ±5ppm of setting, ±1ppm of range/°C; operating limit, ±10ppm of setting, ±2ppm of range/°C.

Maximum Output Current: ±111mA. Output protected from damage with a current limiter. Output may be shorted to ground indefinitely.

Line Regulation: ±2ppm of setting for a 10% line fluctuation.

Compliance Voltage Effect: <±2ppm + 1µV of setting for a 90V change in compliance voltage change.

1.2.3 GPIB Programming

Subsets: SH1, AH1, T6, L4, SR1, RL0, PP1, DC0, DT0, E1.

Line Termination: The GPIB EOI signal is always sent with the last character on a line.

Talker Function: Allows interrogation of the Model 526 by a controller.

Communications Data Rate: 5ms without range change, 45ms with range change.

1.2.4 Terminals

Output Terminals are mounted on both the front and rear panels (rear panel includes a mounted 6-pin Amphenol military style connector, mate supplied). Front terminals are 5-way, gold, low thermal, binding posts on ¾" centers.

Only one set of terminals may be used at a time. Front and rear terminal sets are configured for remote sensing of the output as follows:

High Output and High Sense
Low Output and Low Sense
Chassis Ground

1.2.5 Modes of Operation

Local (LCL): Allows full front panel control.

Recall (RCL): Allows viewing and outputting stored front panel set-ups from memory locations 01 thru 32.

Edit (EDT): Allows for editing any memory location from 01 to 32.

Remote (REM): Indicates when the Model 526 is remotely controlled by IEEE-488 or LAN (optional).

1.2.6 Special Features

Port Selection: Allows setting IEEE-488 port and address or optional LAN port if installed.

Menu Selectable Voltage and Current Limits: Allows setting a voltage limit from 0V to 112V, each polarity and/or a current limit from 0mA to 112mA, each polarity.

Failsafe Hardware Voltage Clamp (Compliance) Limits: Allows setting a hardware clamp voltage. Selections are 120V, 36V, 26V and 16V, ±5% and ±1V.

Power-On Start Sequence: Allows setting the power-on condition to factory default set-up or last setting.

Display Area: Allows partial display of output voltage or full display.

Pass Thru Zero: Allows voltage and current decade controls to pass thru zero.

Remote Protocol: Allows setting remote programming protocol to be Krohn-Hite or Analogic 8200.

1.2.7 General Specifications

Power Requirements: Line voltage, 105 to 130 or 210 to 240 volts ac, single phase, 50Hz/60Hz, 45VA max.

Warm-Up Time (from cal temp): 2 hour to rated accuracy.

Display: 2-line, 40-character, LCD. Displays output settings and other pertinent information.

Pushbutton Keys: Membrane.

Isolation: Power transformer-to-analog output, control logic-to-analog output, optically isolated, 100Vdc to chassis.

Protection: Voltage mode, short-circuit and over-load protected. Current mode, open circuit protected.
Indication by display message. Crowbar, once overload is detected.

Temperature:

Operating Limit: 0°C to 50°C
Calibration: 23ºC ±1ºC
Storage: –40°C to 85°C.

1.2.8 Safety

The Model 526 is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control and laboratory use: IEC61010-1, EN61010-1.

1.2.9 Electromagnetic Compatibility

Emissions and Immunity: EN61326-1, EMC, 61000-4-2; ESD, 61000-4-3; Radiated Immunity,61000-4-4; EFT, 61000-4-5; Surge, 61000-4-6; Conducted Immunity, 61000-4-8; Magnetic Immunity, 61000-4-11; Voltage Interruption EN61010-1.

CE Compliant for Class B Equipment.

1.2.10 Mechanical Specifications

Dimensions and Weights: 4“ (10.28cm) high with feet, 3.5" (9cm) high without feet; 14.15" (36.36cm) wide; 14.3” (36.75cm) deep; 12 lbs (5.4kg) net, 14 lbs (6.3kg) shipping.

1.2.11 General Information

Certification: A Certificate of Compliance is issued with each new instrument to certify the calibration and traceability to N.I.S.T.

Warranty: ONE FULL YEAR warranty on parts and labor includes specifications and performance.

1.2.12 Accessories

USA type 3 terminal line cord. CD operating manual.

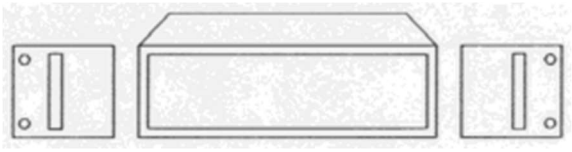
1.2.13 Options

Extended 1 Year Warranty: Part No. EW526.

LAN: Local Area Network to remotely control the Model 526 by a computer.

1.2.14 Optional Accessories

RK-314: Rack Mount Kit permits the installation of the Model 526 into a 19” rack spacing.



PCR100: Precision 100 Ohm Resistor



CAB-005: Cable, multi-stacking double banana plug, two conductor shielded balance line.



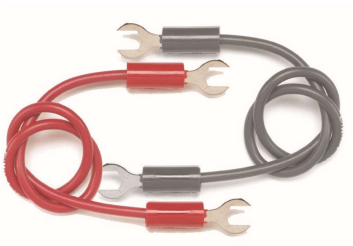
CAB-018: Cable, multi-stacking double banana plug.



CAB-023: Cable Set, Low Thermal EMF Retractable Banana. The CAB023 is a low thermal EMF retractable sheath banana plug patch cord set. These low thermal cables minimize thermal errors so accurate low voltage measurements can be made. Each set includes 2 test leads (one black and one red).



CAB-024: Cable set, low thermal EMF spade lug. The CAB024 is a low thermal EMF spade lug patch cord set for low voltage measurements. These low thermal cables minimize thermal errors so accurate low voltage measurements can be made. Each set includes 2 test leads (one black and one red).



CON13/15: 6-pin Amphenol military style output connector, clamp supplied.



Case-2720B: Carrying Case



Specifications are subject to change without notice.

SECTION 2

OPERATION

2.1 Introduction

NOTE: CAPITALIZED names represent the display area and Selector knob. A [BRACKET] signifies keys.

The Model 526 Precision DC Voltage/Current Source/Calibrator is a highly stable and repeatable DC voltage and DC current source providing N.I.S.T. traceable voltages and currents for use in production, calibration labs, QA and QC departments, design labs, or any place where an accurate voltage and current source is needed. This section will describe each control and function of the Model 526.

WARNING

The 526 Source/Calibrator can supply lethal voltages. To avoid shock hazard, read this section before operating the unit.

2.2 Selecting Line Voltage

The 526 operates from a line voltage of 105 to 130 or 210 to 260 volts ac, single phase, 50Hz/60Hz, 60 watts max. The following paragraphs explain how to change the voltage settings and the fuse.

CAUTION

To avoid shock hazard, connect the factory supplied three conductor line power cord to a properly grounded power outlet. Do not use a two-conductor adapter or extension cord; this will break the protective ground connection. Use the rear-panel CHASSIS GROUND terminal for a protective grounding wire if there is any question about the effectiveness of instrument earth grounding through the power line cord ground wire.

The cover of the Power Entry Module shows four possible voltage settings (100V, 120V, 230V or 240V). Notice that a pin will be in one of these holes, indicating the present voltage setting for the 526. The 526 will NOT operate with voltages than those indicated in the table below.

AC Mains	Pin
105V - 130V	100V or 120V
210V - 260V	230V or 240V

If this setting does not match the voltage available at your site, then it must be changed before powering on the 526. Figure 2.1 shows an example setting for 120 Vac operation.

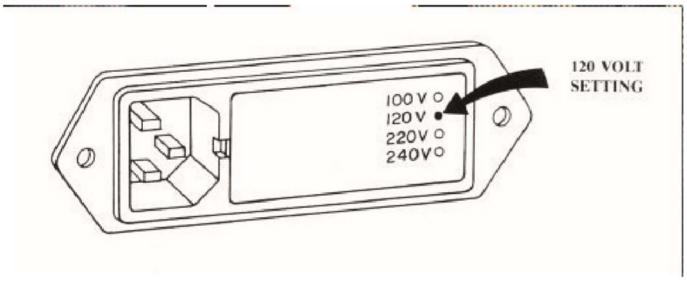


Figure 2.1 Example 120V Setting

Follow the steps below to change a fuse or convert the operating voltage of a 526.

1. Set the 526 power switch to OFF.

2. Unplug the power cord from the ac wall outlet and from the power cord receptacle on the power entry module. See Figure 2.2.

3. Using a small flat blade screwdriver or similar tool inserted into the slot at the left edge of the cover, carefully pry the cover off the fuse cavity.

4. To change the voltage setting, grasp the white plastic voltage select board pin and pull straight outward until the voltage selectboard unseats from the power entry module. Hold the board so that you can read the four voltage selection labels (100, 120, 230 and 240) imprinted on the board. Move the voltage indicator pin to the opposite side of the board from the desired voltage label. Be sure to seat the pin in the notch provided on the board's edge. Install the voltage selectboard so that it is fully seated in the voltage select cavity (the label side toward the fuse cavity).

5. To change the fuse (s), remove the fuse (s) from the fuse carrier on the back of the cover. For 100 or 120 Vac operation, the fuse rating is ¾ Amp, Slo-Blo. For 230 or 240 Vac operation, the fuse rating is 3/8 Amp, Slo-Blo. Be sure to use the correct rating for your voltage selection. For installation, insert the fuse(s) of the proper rating into the fuse carrier.

6. To change the fuse arrangement to match that used in your country, remove the screw from the fuse carrier, remove the fuse carrier, turn the fuse carrier so that the desired fuse arrangement (single fuse or dual fuses) is facing outward, install the fuse carrier, and install the screw. For United States type power operation, use a single standard AGC or 3AG 0.25 inch x 1.25 inches fuse of the correct rating. For European type power operation, use two standard 5.2 mm x 20 mm fuses of the correct rating. For European use, it is important to note that if your local electrical code does not allow a dual fuse arrangement, then a dummy fuse must be installed in the lower fuse carrier. Otherwise, the 526 will not operate.

7. Place the cover on the power entry module and press inward until it snaps into place. Verify that the desired operating voltage is indicated with the voltage select board pin on the cover label.

8. Connect the power cord to the power entry module and wall outlet. The 526 is now ready to be operated on the selected ac line voltage.

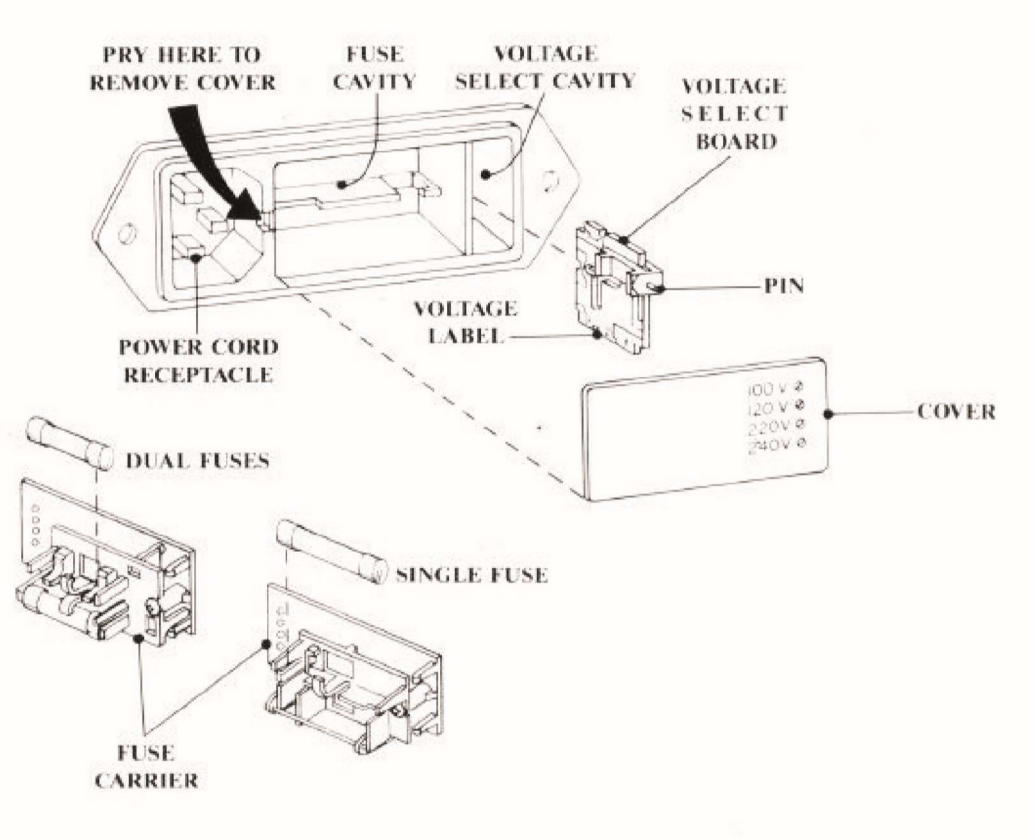


Figure 2.2 Power Entry Module

2.3 Placement and Rack Mounting

You may place the 526 on a bench top or mount it in a standard-width, 24-inch (61-cm) deep equipment rack. For bench-top use, the 526 is equipped with non-slipping, tilt, non-marring feet. To mount the 526 in an equipment rack, use the Rack Mount Kit, Model RK-314.

2.4 Quick Start

After the 526 has been unboxed and set to the proper line voltage setting, the unit is ready to turn on. Plug the 526 into the power source and turn on.

The first time turned on, the 526 will display the factory default settings. The OUTPUT display should indicate "ACTIVE". If not, press the [CROWBAR] key. Now turn the decade knobs to the desired voltage.

NOTE: When the 523's Power-On setting is set for LAST LCL SETTING, the output terminals will be crowbarred. Press the [CROWBAR] key to activate output terminals after power-on.

2.4.1 526 Tones

The 526 has a tone generator that beeps when an entry has been made, a non-active key was pressed, or an entry that was to exceed a limit was attempted. The short beep means the entry was correct. A long beep indicates the attempted entry was already selected or incorrect.

2.4.2 LOCAL Key

Pressing the [LOCAL] key will always return the 526 to the last local setting, whether it be from remote operation or from within a MENU FUNCTION.

2.4.3 SELECTOR Knob

The SELECTOR knob control is used to select a memory location for recalling or storing front panel set-ups; or is used to select/set items from within the MENU Mode. It is always active in the LCL Mode for selecting memory locations. The memory location viewed does not become active at the output terminals until [RECALL] and [UPDATE OUTPUT] is pressed.

2.4.4 Setting a Voltage/Current

To set a voltage or current, do the following in LCL mode.

1. Check if LCL is displayed in the MODE display. If not, press [LOCAL]

2. Press the [V/mA] key to set the desired FUNCTION of voltage or current.
   When pressed, the OUTPUT SETTING display indicates mV or mA and the OUTPUT display indicates CROWBAR. This is done to protect the unit under test (UUT), that may be connected to the 526, from damage.

3. Press [+/-] key to select positive or negative voltages/currents.

4. To set the desired range press [DOWN] or [UP] RANGE keys.
   The LED's between the 3 MSD decades are decimal place indicators (see para 2.4.5).

   NOTE: When changing the range from a higher range to a lower range and the voltage/current exceeds the maximum limit for the new range, the 526 sets the voltage/current to the maximum Limit for the new range. If you change to a higher range, the 526 will maintains the same voltage from the previous or lower range.

5. Turn the decade controls, below the display, to set the desired voltage/current.

6. Press [CROWBAR] to activate the output terminals. The OUTPUT display now indicates ACTIVE.

2.4.4.1 Decade Controls

Six microprocessor assisted decade controls provide continual use of any one decade with full carry and borrow capability to and from all more significant decades for easier use and convenient manual operation. Decade controls will only function when setting a voltage or current.

2.4.5 Selecting a Range

To set the desired range press [DOWN] or [UP] RANGE keys. The LED's between the 3 MSD decades are decimal place indicators. Below is a chart showing each range LED.

Indicates 100mV, 100V or 100mA Range is set. OUTPUT SETTING display will indicate either XX.XXXXmV, XX.XXXXV or X.XXXXmA.	
Indicates 1V Range is set. OUTPUT SETTING display will indicate XXXXXXV. Indicates 10V or 10mA Range is set. OUTPUT SETTING will display indicate either X.XXXXXV or X.XXXXXmA.	 

2.4.6 Recalling Memory Set-Ups

To recall a saved set-up from a memory location, do the following:

1. Press [RECALL] key.
2. Turn the SELECTOR knob to the desired memory location and the contents will be displayed.
3. Press [OUTPUT UPDATE] to set the recalled voltage/current at the output terminals.
   To continue recalling saved setting, turn the SELECTOR knob to the next memory location and press [OUTPUT UPDATE]. If CROWBAR is displayed, press [CROWBAR] to change to ACTIVE.

Settings that are stored in memory include voltage and current values, 2-wire/4-wire and active/crowbar. All other settings are system settings.

NOTE: This feature works well when using as a calibrator. Simply save the voltages/currents in the testing order needed into memory and recall them in that exact order.

2.4.7 Saving Set-Ups into Memory

Saving front panel set-up conditions into memory is done by doing the following:

1. Turn the SELECTOR knob to the desired memory location displayed under MEMORY.
2. Press [RECALL] key.
3. Press [EDIT] key.
4. Set the following parameters to the desired values by doing the following:

   Turn the decade controls, below the display, to set the desired voltage/current.
   Press [CROWBAR] for either CROWBAR or ACTIVE OUTPUT. Press [2W SENSE 4W] for 2-wire or 4-wire operation.
5. Press [ENTER/STORE] to save the set-up into selected memory location.

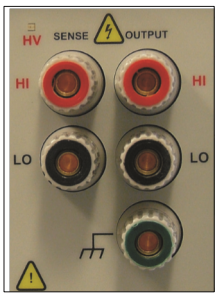
Settings that are stored in memory include voltage and current values, 2-wire/4-wire and active/crowbar. All other settings are system settings.

NOTE: Each time [ENTER/STORE] is pressed, the unit will return to RCL Mode. To edit and save another set-up, turn the SELECTOR knob to the next desired memory location, press [EDIT], and repeat steps 4 and 5.

2.4.8 Front Panel Output Terminals

The 526 front panel output terminals are 5-way binding posts. Spacing is the standard ¾" centers. This 4-wire system eliminates the IR drop effects and thus maintains the voltage accuracy at the load.

Connections are as follows:



The load and sense refers to 4-wire remote sensing capability.

Note: The Load-Sense circuit must be complete in either one of two configurations. See Figure 2-3.

For current mode or for driving high impedances in the voltage mode, only two wires may be connected to the load. However, if an appreciable current is to flow in the circuit, in the voltage mode (0.1mA), then the sense lines should be connected at the load.

2.4.8.1 HV Led

The HV (high voltage) LED illuminates when the output voltage is approximately 25V. It is used as a WARNING only.

2.4.8.2 Wire Connections

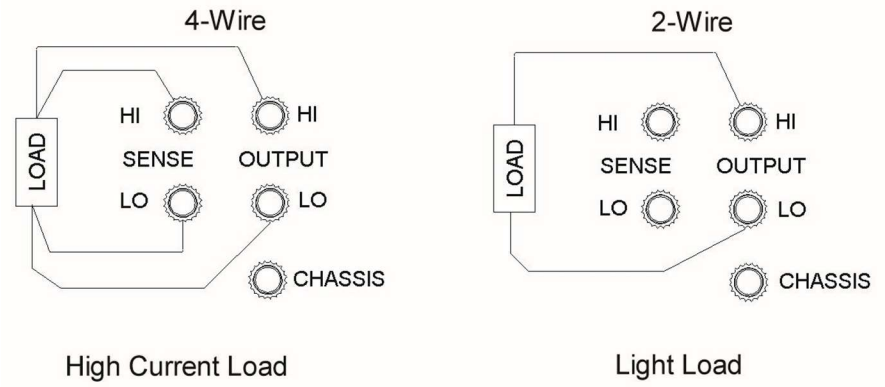


Figure 2.3 4-Wire and 2-Wire Connections

When making connections to the Model 526, it is desirable to make them in a way that minimizes the thermally generated voltages (thermal EMF) produced at the junction of two metals. All connections will produce thermal voltages. They are inescapable. To minimize these effect, use good quality wires, patch cords or cables that are designed for low thermal EMF. Have as few interconnections as possible and an equal number of interconnections in the HI and LO sides.

When using the 4-wire operation, the HI and LO SENSE are the critical connections and require attention. The thermal EMF generated on the HI side connections will have the opposite polarity to those on the LO side; only if the same type of wire and connection method is used on both HI and LO terminals and all internal interconnections. This will result in the thermal EMF canceling to the extent that the two match. This also requires that all the connections are at or close to the same temperature.

Krohn-Hite makes the following suggestions for connecting the 526 to achieve optimum results.

The simplest connection method is with twisted pair wire stripped and placed under HI and LO binding posts, tightening them down for good solid connection. The connection is directly from wire to binding post with no other connections in the middle such as a banana plug or spade lug. This follows the minimum number of interconnections rule, but may be inconvenient or too fragile.

2.4.9 Rear Panel Connectors



2.4.9.1 IEEE-488 Connector

The model 526 is compatible with the IEEE Std. 488/1978. The applicable reference publication is: IEEE Standard Digital Interface for Programmable Instrumentation (IEEE Std. 488/1978).

Publisher:
The Institute of Electrical and Electronics Engineers, Inc. IEEE.org

The <GPIB> makes it possible for a user to connect various instruments and components together into a functional system. However, this system will not work without the proper software. The drivers for the IEEE-488 interface offers a set of functions and commands which the user can assemble into a written program. Once written, the user's application program, in conjunction with the driver, will allow the various instruments on the <GPIB> to generate signals, take measurements, and allow the instrument controller to manage the resulting information.

To activate GPIB remote operation, first select IEEE-488 (GPIB) from the Port Selection Menu. Once selected, you can set the address from 0 to 30. The default setting from the Factory is 9. Zero (0) is usually used for the controller in charge.

2.4.9.2 Optional LAN Connector (Option: LAN)

The LAN port connector is provided for remote operation. To activate LAN remote operation if installed, first select LAN from the Port Selection Menu.

2.4.9.3 Power Entry Module

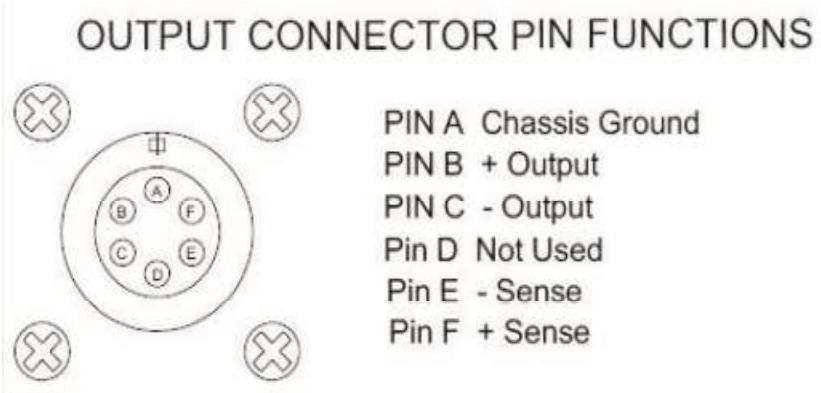
Refer to page 2-1, section 2.2 Selecting Line Voltage.

2.4.9.4 Rear Panel Output Connector and Mating Connector

The Model 526 provides a 6-pin Amphenol military style rear panel output connector. The pin-out connectors are explained below. An optional mating connector and clamp is available (CON015 and CON013).



1) Output Connector CON 015
2) Connector Clamp CON 013



PIN Connections

A Chassis ground
B + (high) load
C - (low) load
D No Connection
E - (low) sense
F + (high) sense

2.4.9.5 Chassis Ground/Safety Ground

To avoid shock hazard, connect the factory supplied 3-conductor power line cord to a properly grounded power outlet. Do not use a two-conductor adapter or extension cord; this will break the protective ground connection.

Use the rear-panel CHASSIS GROUND terminal for a protective grounding wire if there is any question about the effectiveness of instrument earth grounding through the power line cord ground wire.

2.5 Front Panel Controls

The Model 526 was designed for ease of use. All front panel operation is accomplished with either a press of a button or by turning the decade control knob. Menu functions are provided for selecting instrument set-ups such as "Pass Thru Zero", "Full or Partial Display", "Port Selection", etc. Normally these settings are set and are not changed.

2.5.1 Membrane Keys

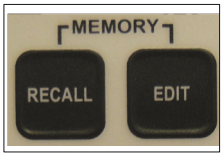
Front panel membrane keys are used for all operating functions. Immediate executable keys are POLARITY, 2W SENSE 4W, CROWBAR, RANGE and FUNCTION. The following pages explain each front panel key and its function.



2.5.1.1 [ENTER/STORE] Key

When pressed, the output settings are be stored to the memory location selected in the MEMORY display. It also completes the task that is selected from the MENU function.

2.5.1.2 [RECALL] Key



When [RECALL] key is pressed, the 526 will enter the RCL mode of operation. The SELECTOR knob is active and will increase or decrease the memory location displayed under MEMORY on front panel.

Once a memory location is selected, pressing the [UPDATE OUTPUT] key will change the output terminals to the voltage/current setting that was stored in the selected location. Simply turn the SELECTOR knob again to select another memory location and press the [UPDATE OUTPUT] key again to recall that location and so on.

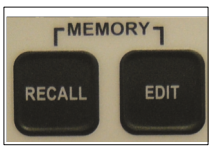
Pressing [EDIT] key will place the 526 into the EDT mode. This allows editing the displayed memory data. See [EDIT] KEY for more detail below. Pressing the [LOCAL] key will return the 526 to the LCL mode of operation.

NOTE: If [UPDATE OUTPUT] key is not pressed before returning to local mode, the unit will be at the last output setting.

When in the RCL mode, all front panel controls are inactive except for the [UPDATE OUTPUT], [EDIT] and [LOCAL] key.

Note: This feature simplifies the testing and calibration of meters and/or oscilloscopes. Simply save the voltages or currents in the testing sequence needed into memory and recall them in that same exact order. The maximum steps is 32.

2.5.1.3 [EDIT] Key



When the [EDIT] key is pressed, it will place the 526 in EDT mode only if it was from RCL mode.

If pressed when not in the RCL mode, a long beep will sound, indicating the unit is not in the RCL.

When a memory location is selected from the RCL mode, pressing the [EDIT] key will allow editing the output parameters for that memory location. Press [UPDATE OUTPUT] key to update the output terminals to the new setting, or press the [STORE] key to save the new value.

Each time the [ENTER/STORE] key is pressed to save the settings, the 526 will return to the LCL mode of operation and the new output settings will be saved.

NOTE: The 526 must first be in RCL mode for EDT mode to function.

2.5.1.4 [LOCAL] Key



When pressed from any other mode or function, the 526 will return to LCL (local mode) and all front panel controls will be active.

When the 526 is in Local (LCL) mode, and the instrument is addressed over the GPIB interface bus or LAN, the unit will switch to the Remote mode and front panel controls are inactive except for the [LOCAL] key. The MODE display will indicate REM.

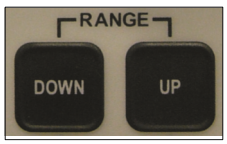
Pressing the [LOCAL] key will return the unit to LCL mode from any MENU function or RCL mode.

2.5.1.5 [+/-] POLARITY Key



When pressed, the 526 will toggle between plus and minus polarity. Polarity function operates the same for both voltage and current.

2.5.1.6 [DOWN] and [UP] RANGE Keys



When pressed, the 526 output range will increment or decrement the output to the next range. Selectable ranges are 100mV, 1V, 10V and 100V; 10mA and 100mA.

The LED's between the 3 most significant decade switches will illuminate, indicating the decimal place of the output setting.

Indicates 100mV, 100mA or 100V Range is set. OUTPUT SETTING display will indicate either XX.XXXXmV, XX.XXXXV or X.XXXXmA.



Indicates 1V Range is set. OUTPUT SETTING display will indicate. XXXXXXV.



Indicates 10V or 10mA Range is set. OUTPUT SETTING will display indicate either XXXXXV or X.XXXXXmA.



2.5.1.7 [VOLTS/MILLI AMP] Key



When pressed, the 526 will change the output setting to Volts or Current operation and CROWBAR the output terminals.

The output changes to CROWBAR for safety reasons.

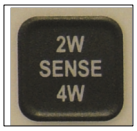
2.5.1.8 [CROWBAR] Key



When pressed, the 526 will toggle between CROWBAR and ACTIVE output. In CROWBAR, the internal voltage is set to 0V, disconnects the output amplifier, and connects the HI and LO output terminals together through relay contacts. It is a way to set the 526 to a NO OUTPUT state.

When set to ACTIVE, the output voltage or current will be set at the output terminals.

2.5.1.9 [2W SENSE 4W] Key



When pressed, the 526 toggles between 2-wire or 4-wire operation. The SENSE terminals are active in the 4W mode only. Display will indicate 2 or 4 under SENSE.

2.5.1.10 [UPDATE OUTPUT] Key

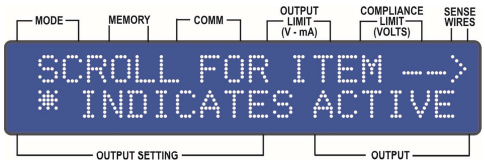


When pressed from the RCL mode, the saved parameters for that memory location will be set at the output terminals. If the memory location being recalled is set for ACTIVE output, both the [OUTPUT UPDATE] key, then the [CROWBAR] key, must be pressed to activate the output. From the Edit Mode, parameters can be changed and sent to the output terminals without changing or saving the information to memory location displayed by pressing [OUTPUT UPDATE] key, and not [ENTER/STORE].

2.5.1.11 [MENU] Key



When [MENU] pressed, the 526 enters the MENU mode where various operating conditions can be set. The display will indicate:



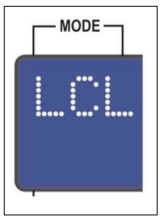
The arrow in this display is pointing to the SELECTOR knob to the right of the display, when turned (CW), will display menu items from 1 to 10. An asterisk (*) indicates a sub-menu item is active. All menu display information will wrap around to the beginning when continuously turned from the end menu item.

1 VIEW SET-UP - Displays the set-up conditions of 526.
2 PORT SELECTION - Sets remote control port of IEEE-488 or LAN.
3 V OUTPUT LIMIT - Sets positive and negative voltage limits.
4 I OUTPUT LIMIT - Sets positive and negative current limits.
5 V COMPLIANCE LIMIT - Sets a hardware voltage limit.
6 POWER ON SET-UP – Sets power-on set-up to factory defaults or last setting.
7 DISPLAY AREA - Sets full or partial display.
8 PASS THRU ZERO - Sets decade control pass thru zero to on or off.
9 CLR USER MEMORY - Clears all memory locations.
10 10 REMOTE PROTOCOL - Sets remote protocol.

2.6 Display Information

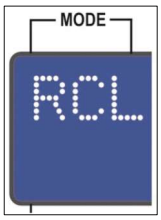
The 526 display is a 2-line, 40-character display that indicates the set-up conditions and output settings. Output values (or potential values if in CROWBAR or RECALL Modes) are displayed using 6 digits plus a polarity sign. Below explains each Display item in detail.

2.6.1 Mode



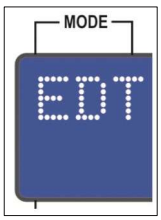
There are 4 modes of operation for the 526, local (LCL), recall (RCL), edit (EDT) and remote (REM).

Local (LCL) - Indicates 526 is in the local mode. All front panel controls are active.

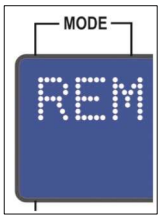


Recall (RCL) - Indicates 526 is in the recall mode. All front panel controls are inactive, except for [LOCAL] key, [UPDATE] key and the SELECTOR knob.

Turn the SELECTOR knob will change desired memory location to be recalled.



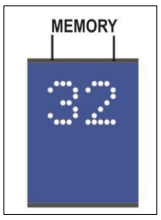
Edit (EDT) - Indicates 526 is in the edit mode. All front panel controls are active except for the [MENU] and [RECALL] keys. Pressing [ENTER/STORE] key will save the output settings to the memory location in the MEMORY display. [UPDATE OUTPUT] will update the output terminals to the voltage settings in the display.



Remote (REM) - Indicates the 526 is in the remote mode and is being controlled via IEEE-488 or LAN input. All front panel controls are inactive except for [LOCAL] key. Pressing [LOCAL] will return the 526 to local operation.

2.6.2 Memory

32 non-volatile memory locations are provided from 01 to 32 for storing and recalling: output voltage, current, 2-wire and 4-wire, active and crowbar values that can be recalled at a later time. Memory location 00 is reserved for Factory Default settings and cannot be altered. See Section 2.7.6.

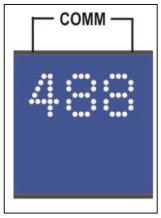


Indicates memory location 01 to 32 to be recalled. Turning the SELECTOR knob will change to the next memory location, but will not change the OUTPUT
SETTING displayed or the output setting.

Note: Not displayed in REM mode.

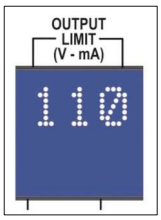
To view what is in memory press [RECALL]. Output will not change until [UPDATE OUTPUT] key is pressed. Refer to [RECALL] key and [EDIT] key for more detail.

2.6.3 Comm



Indicates the active communications port of 488 (IEEE-488) and LAN (optional).

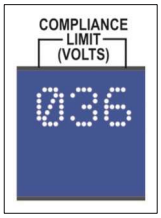
2.6.4 Output Limits (V-mA)



Indicates the voltage or current limit set from MENU mode. The +/- polarity in the OUTPUT SETTING display indicates the polarity of the limit displayed under OUTPUT LIMIT (V/mA).

A long beep will sound when attempting to exceed the limit.

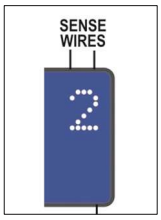
2.6.5 Compliance Limits (Volts)



Indicates the hardware voltage clamp limit. Available limits selections are 120V, 36V, 26V and 16V.

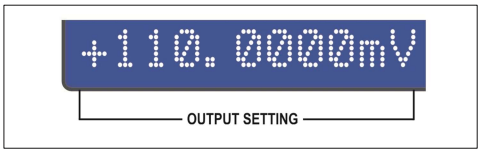
When the compliance limit is exceeded, the OUTPUT will CROWBAR and a beep will sound and the display will cycle an OVERLOAD condition. This condition will continue until a key is pressed or a decade knob is turned. The voltage must be lowered to a value that does not exceed the limit. If the [CROWBAR] is pressed and the voltage is not low enough, the OVERLOAD and beep will cycle again.

2.6.6 Sense Wires



Indicates active output terminals of 2-Wire (normal operation) or 4-Wire (remote sense operation).

2.6.7 Output Settings

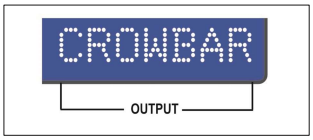


In the LCL and REM modes, displays output voltage/current setting at the output terminals.

In the RCL mode, displays the output setting set in the memory location displayed.

In the EDT mode, displays the output setting that can be stored in memory or set at the output terminals.

2.6.8 Output



Displays the output terminal condition of ACTIVE or CROWBAR.

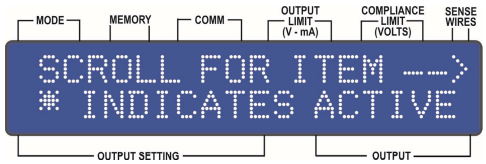
When ACTIVE, the output terminals will be set to the selected voltage or current displayed under OUTPUT SETTING display.

When CROWBAR, the internal voltage is set to 0V, disconnects the output amplifier, and connects the HI and LO output terminals together through relay contacts. Set the 526 to a NO OUTPUT state.

2.7 Menu and Selector Knob Control

The following information is an explanation of the MENU system. To activate the MENU system, press the [MENU] key.

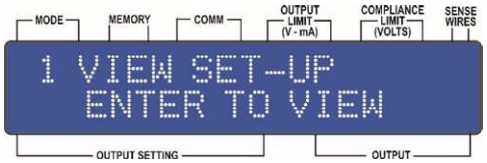
When [MENU] pressed, the display will indicate the following:



Continuously turning the SELECTOR knob will scroll through the items in the MENU, see paragraph 2.5.1.11. An * indicates the current displayed setting is active.

2.7.1 Menu 1 - View Set-Up

View Set-Up allows the user view the 10 set-up conditions for the 526. These conditions cannot be altered in this mode, only viewed.

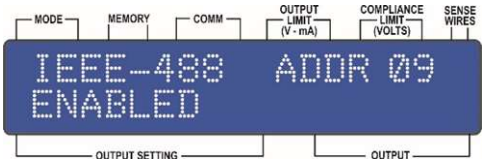


When [ENTER/STORE] is pressed, the following information will be displayed when scrolling with the SELECTOR knob.

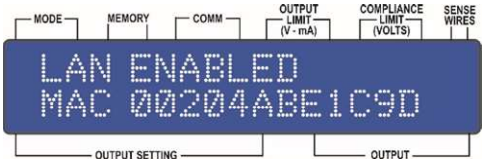
IEEE-488 Enabled/Disabled and Address
LAN Enabled/Disabled and MAC Address
+/- Voltage Limits
+/- Current Limits Compliance Limit
Power On Sequence
Display View
Pass Thru Zero On/Off
Remote Programming Protocol

2.7.1.1 Port Setting View

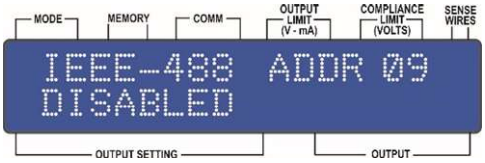
Possible settings are IEEE-488 or LAN.



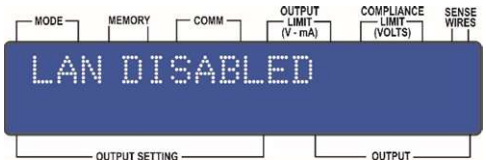
Indicates the IEEE-488 port is enabled and the address set is 09.



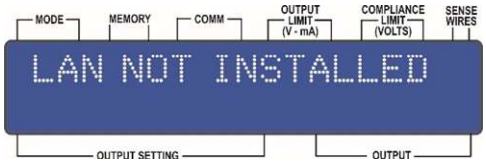
Indicates LAN is enabled and reports MAC address



Indicates IEEE-488 port is disabled.

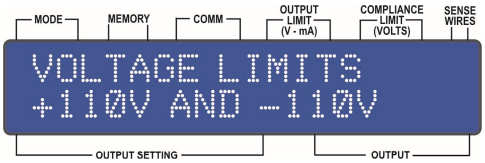


Indicates the LAN (optional) is disabled



Indicates the LAN (option) is not installed.

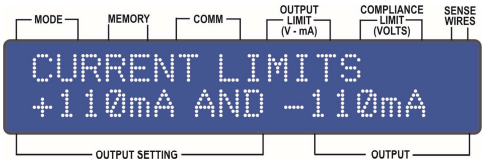
2.7.1.2 Voltage Limits View



Indicates the positive and negative voltage limits. In this example the limits are set to 110V and -110V.
Possible limits can be any value from 0V to 112V.

NOTE: Exceeding limit in remote will cause a DATA ERROR and the output will not change.

2.7.1.3 Current Limit View

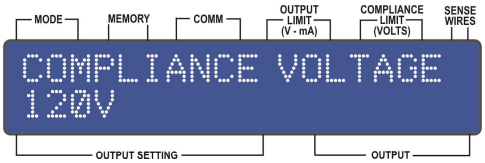


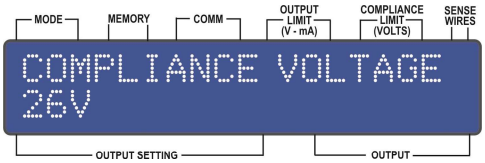
Indicates the positive and negative current limits. In this example the limits are set to 110mA and -110mA. Possible limitscan be any value from0mAto 112mA.

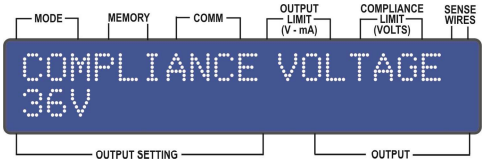
NOTE: Exceeding limit in remote will cause a DATA ERROR and the output will not change.

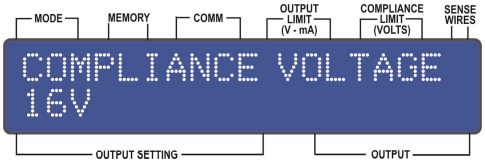
2.7.1.4 Compliance Voltage View

When viewed, indicates the Compliance Voltage limit setting. Possible settings are 120V, 36V, 26V and 16V. Tolerance is 5% of setting ±1V.

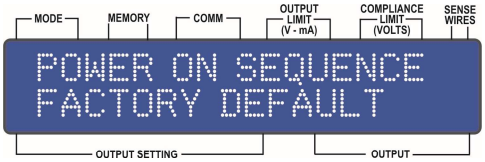




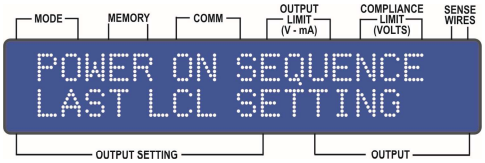




2.7.1.5 Power-On Sequence View



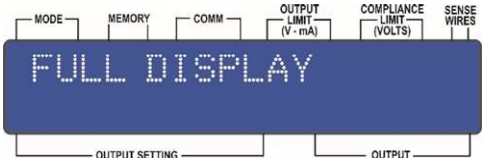
Indicates the Power On Sequence is set to "Factory Defaults". Each time the 526 is powered on, it will return to Factory Default settings (see Section 2.7.6).



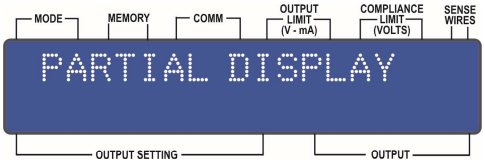
Indicates the Power On Sequence is set to "Last LCL Setting". Each time the 526 is powered on, it will return to the last local settings when the unit was last turned off.

NOTE: The 523 will be in CROWBAR state when powered on.

2.7.1.6 Full or Partial Display View

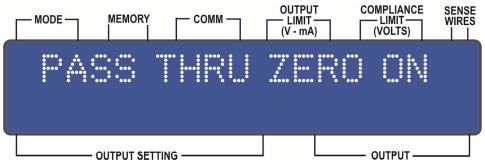


All items in the display will be visible.

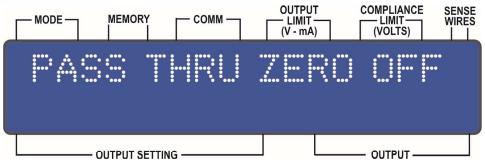


Display will only show MODE, MEMORY, OUTPUT SETTING, OUTPUT and SENSE. COMM, OUTPUT LIMIT (V/mA) and OUTPUT COMPLIANCE (Volts) will appear when in FULL DISPLAY Mode or when returning to local operation from another Function.

2.7.1.7 Pass Thru Zero View

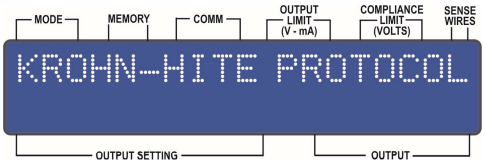


Indicates the decade controls will pass through zero (from positive to negative and negative to positive).

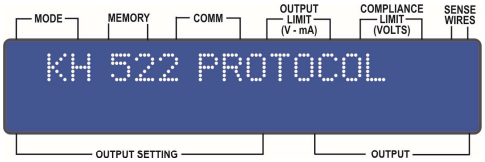


Indicates the decade controls will NOT pass through zero (from positive to negative and negative to positive). The 526 is will sound a long beep when the decade control attempts to PASS THRU ZERO.

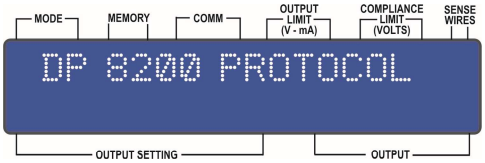
2.7.1.8 Remote Protocol View



Indicates the remote programming protocol is set to KH 526 Protocol. The 526 will also accept the older Model 522RA7 protocol in this mode.

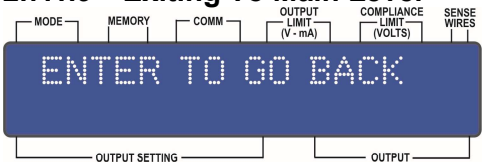


Indicates the remote programming protocol is set to Krohn-Hite Model 522. The 526 will only accept the Model 522 protocol in this mode. The display will indicate the output setting and whether it is active or crowbar.



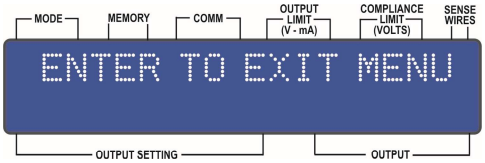
Indicates the remote programming protocol is set to Analogic/DP 8200. The 526 will only accept the Model 8200 protocol in this mode. The display will indicate the output setting and whether it is active or crowbar.

2.7.1.9 Exiting To Main Level



When [ENTER] is pressed, the 526 will return MENU back to 1 VIEW SET-UP.

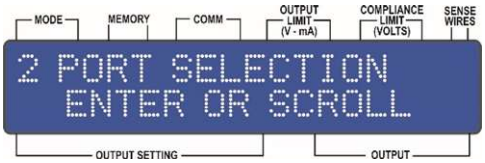
2.7.1.10 Exiting Menu and Returning to Local Operation



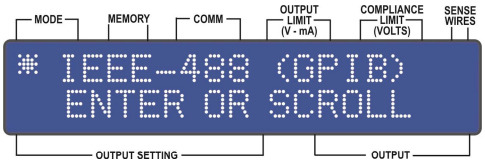
When [ENTER] is pressed, the 526 will EXIT MENU mode and return to LCL mode.

2.7.2 Menu 2 - Port Selection

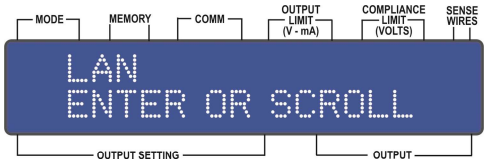
Port Selection provides for the set-up of the 526 remote programming port to either IEEE-488 (GPIB) or LAN. An asterisk (*) beside the selected item indicates that it is enabled.



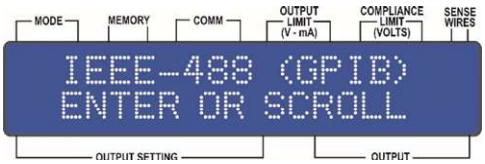
When [ENTER] is pressed, the display will indicate IEEE-488 (GPIB); turning the SELECTOR knob will change the display to LAN. Continuing to turn the SELECTOR knob will change the display to ENTER TO GO BACK and ENTER TO EXIT MENU returning back to IEEE-488 (GPIB).



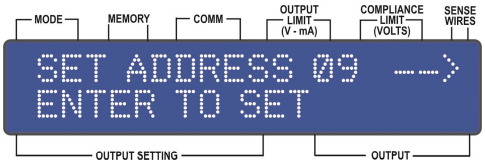
Indicates GPIB is selected.



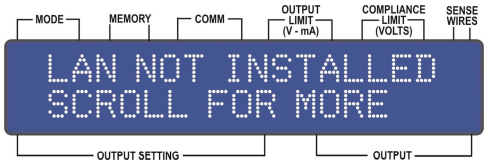
Indicates LAN is available for selection.



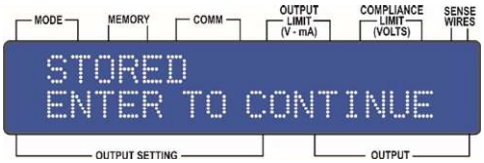
Indicates GPIB is available for selection.



Display for entering in GPIB address.



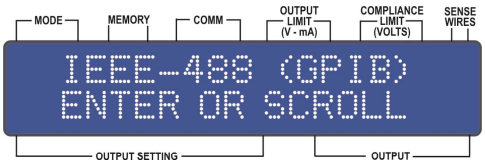
Indicates LAN is not installed.



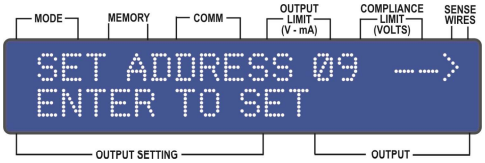
Indicates setting has been stored and pressing [ENTER] will return display to 2 PORT SELECTION.

2.7.2.1 IEEE-488 (GPIB)

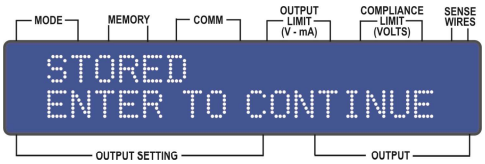
When [ENTER] is pressed, the IEEE-488 port becomes enabled and the display will change to allow for the IEEE-488 port ADDRESS setting.



Turn the SELECTOR knob to increment or decrement the address setting to a desired setting between 0 and 30. When set to the desired address, press [ENTER] to store.

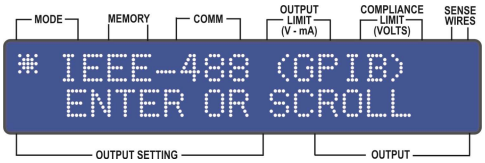


When [ENTER] is pressed, the display will indicate STORED and ENTER TO CONTINUE. Pressing [ENTER] will return the display to 2 PORT SELECTION.



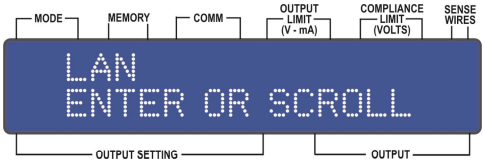
Press [ENTER] again and the display will indicate, with an asterisk (*), that the IEEE-488 port is enabled.

Scroll to continue to another MENU ITEM or scroll to ENTER TO EXIT MENU to return to local operation.

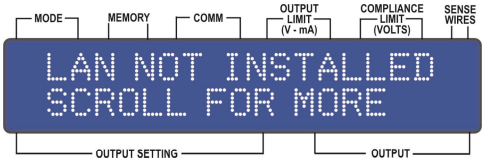


2.7.2.2 LAN (Optional)

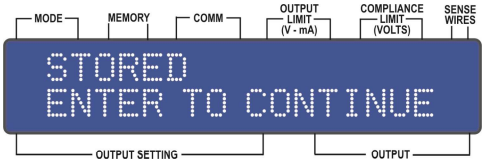
When [ENTER] is pressed, the LAN port becomes enabled and the display will indicate that the selection has been STORED and to PRESS ENTER TO CONTINUE.



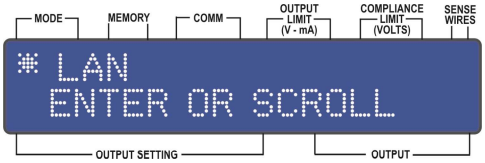
If the LAN is not installed, when [ENTER] is pressed the display will indicate "LAN NOT INSTALLED, SCROLL FOR MORE".



If the LAN is installed, the display will indicate, with an asterisk (*) that the LAN port is enabled, if not press [ENTER] to select. The display will indicate STORED and ENTER TO CONTINUE. Pressing [ENTER] again will return the display to 2 PORT SELECTION.



Scroll to continue to another MENU ITEM or scroll to ENTER TO EXIT MENU to return to local operation.

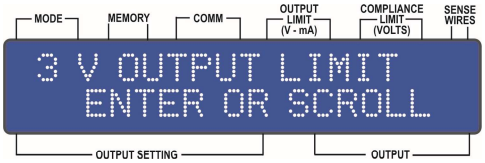


2.7.3 Menu 3 - V Output Limit

The Model 526 provides the ability to set a voltage limit for both positive and negative polarities. The limits are settable between 0V and 112V. When the POLARITY is set to +, the Output Limit will be positive and the display will indicate the set value under OUTPUT LIMIT (V-mA). When the POLARITY is set to -, the Output Limit in the display will be minus.

A long beep will sound if turning the decade control attempts to exceed a limit.

NOTE: The V Output Limit is only effective in the VOLTAGE MODE.



When [ENTER] is pressed, the display will indicate POS. VOLTAGE LIMIT, turning the SELECTOR knob will change the display to NEG. VOLTAGE LIMIT. Continuing to turn the SELECTOR knob will change the display to ENTER TO GO BACK and ENTER TO EXIT MENU, eventually returning back to POS. VOLTAGE LIMIT.

Press [ENTER] to change the positive voltage limit.

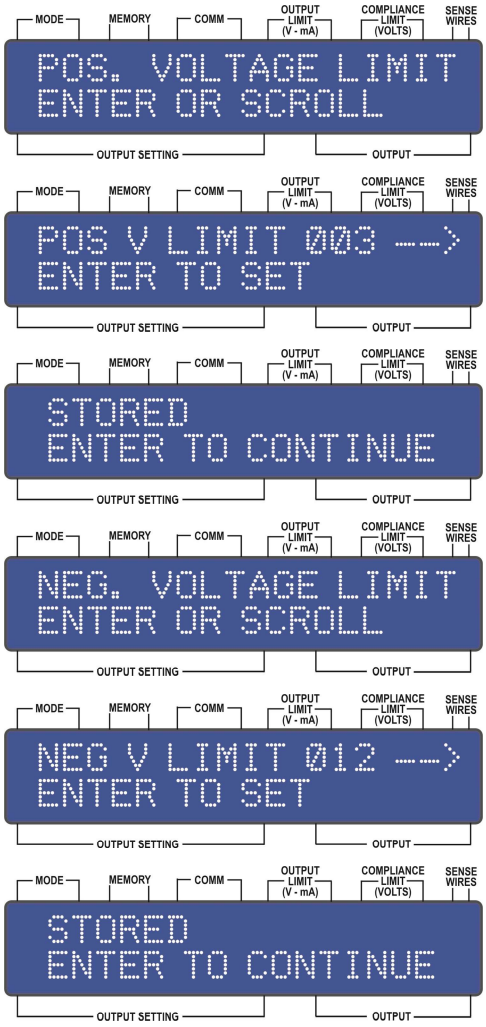
To set the positive voltage limit, turn the SELECTOR knob to a value between 0V and 112V. Press [ENTER] to set the value.

Once [ENTER] is pressed, the display will indicate the setting is STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will return the display to 3 V OUTPUT LIMIT.

Press [ENTER] to set the negative voltage limit. Turn the SELECTOR knob until NEG. VOLTAGE LIMIT is displayed. Press [ENTER] to select. The display will indicate NEG V LIMIT XXX. Turn the SELECTOR knob to a value between 0V and 110V.
Press [ENTER] to set the value.

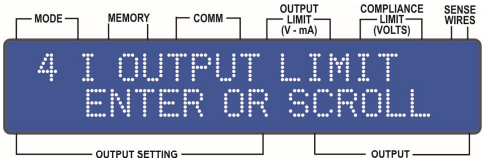
The display will indicate the setting is STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will return the display to 3 V OUTPUT LIMIT.

Scroll to continue to another MENU ITEM or scroll to ENTER TO EXIT MENU to return to local operation.



2.7.4 Menu 4 - Output Limit

The Model 526 provides current limiting for both positive and negative polarities. The limits can be set between 0mA and 112mA. When the POLARITY is set to +, the Output Limit will be positive and the display will indicate the set value under OUTPUT LIMIT (V-mA). When the POLARITY is set to -, the Output Limit in the display will be minus. A long beep will sound if turning the decade control attempts to exceed a limit.



When [ENTER] is pressed, the display will indicate POS. CURRENT LIMIT, turning the SELECTOR knob will change the display to NEG. CURRENT LIMIT. Continuing to turn the SELECTOR knob will change the display to ENTER TO GO BACK and ENTER TO EXIT MENU returning back to POS. CURRENT LIMIT.

Press [ENTER] to change the positive current limit.

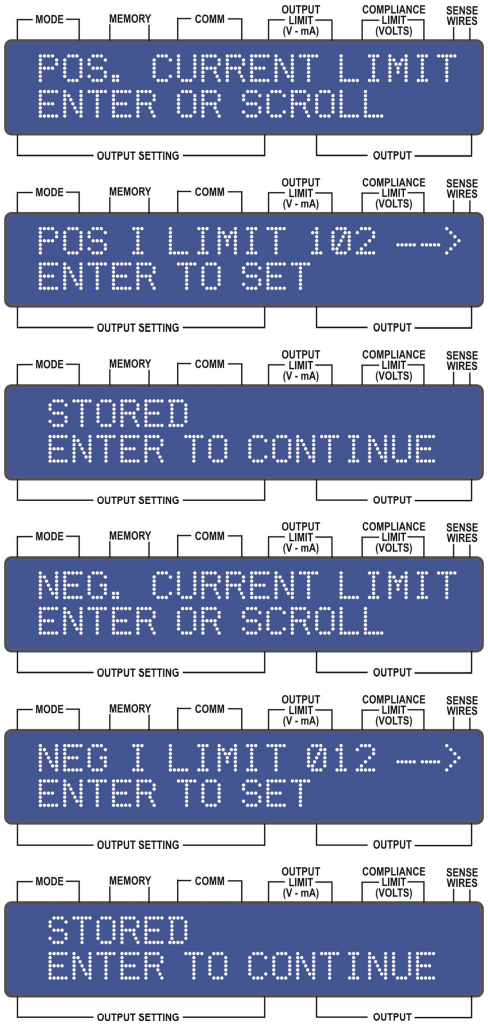
To set the positive current limit, turn the SELECTOR knob to a value between 0mA and 112mA. Press [ENTER] to set the value.

Once [ENTER] is pressed, the display will indicate the setting is STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will return the display to 4 I OUTPUT LIMIT.

Press [ENTER] to set the negative current limit. Turn the SELECTOR knob until NEG. CURRENT LIMIT is displayed. Press [ENTER] to select. The display will indicate NEG I LIMIT XXX. Turn the SELECTOR knob to a value between 0mA and 110mA. Press [ENTER] to set the value.

The display will indicate the setting is STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will return the display to 4 I OUTPUT LIMIT.

Scroll to continue to another MENU ITEM or scroll to ENTER TO EXIT MENU to return to local operation.



2.7.5 Menu 5 - V Compliance Limit (Fail Safe)

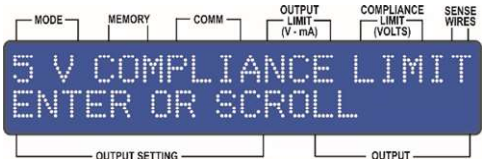
The V Compliance Limit was provided as a second level of hardware protection for the 526. How it works is quite simple. If the 526 is operating in the current mode and the load is removed from the output terminals, the output voltage will be limited to the Compliance level that is set. The output will then switch to CROWBAR and the unit will flash OVERLOAD in the display. Likewise, in the voltage mode, when a voltage value is entered that exceeds the V Compliance Limit, the 526 will flash "OVERLOAD" in the display and the unit will be placed in CROWBAR mode.

The 526 will continue beeping in each of these modes until the voltage or current is lowered to a setting below the V Compliance Limit setting.

The following chart details the hardware limit for each set value. Tolerance is 5% of setting ±1V.

Voltage (±)		Current		
Setting	Limit	No Load (±)	10mA (±)	100mA (±)
120V	120V	124V	123V	114V
36V	36V	36V	35V	26V
26V	26V	26V	25V	16V
16V	16V	16V	15V	6V

2.7.5.1 Changing V Compliance Limit



From the Menu Function, scroll to 5V COMPLIANCE LIMIT. Press [ENTER].

First option in the display will be 120V. An * indicates this option is selected. If not, press [ENTER] to select or scroll to next option.

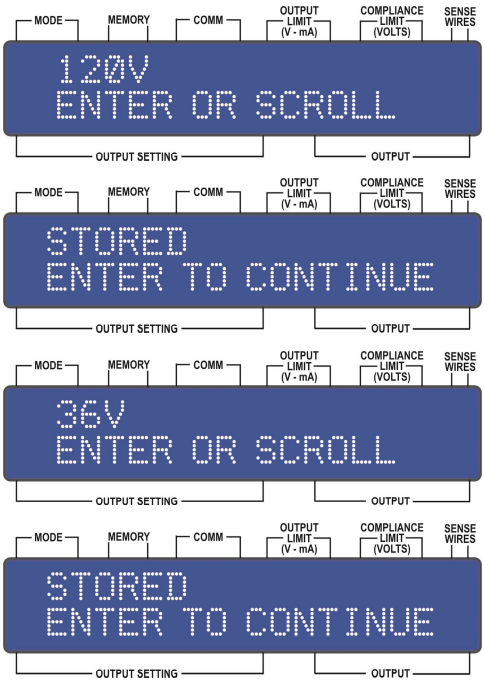
When pressing [ENTER] the display will indicate that the 120V selection was STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will return the display to 5 V COMPLIANCE LIMIT.

Second option in the display will be 36V. An * indicates this option is selected. if not, press [ENTER] to select or scroll to next option.

When pressing [ENTER] the display will indicate that the 36V selection was STORED and to press ENTER TO

CONTINUE. Pressing [ENTER] will return the display to 5 V COMPLIANCE LIMIT.

Scroll to continue to another MENU ITEM or scroll to ENTER TO EXIT MENU to return to local operation.



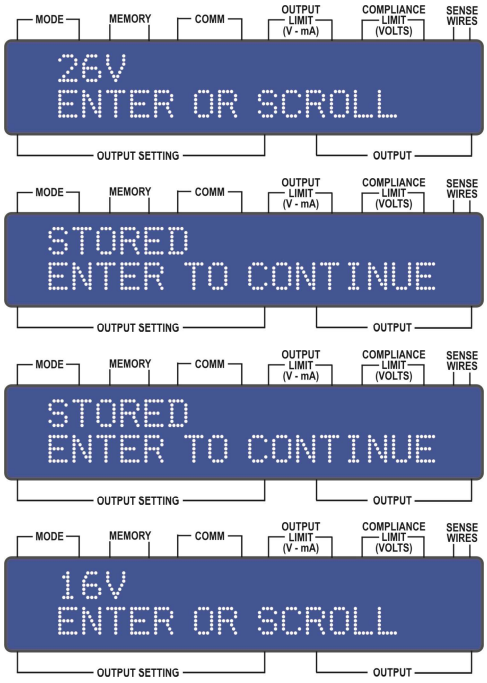
Third option in the display will be 26V. An * indicates this option is selected. If not, press [ENTER] to select or scroll to next option.

When pressing [ENTER] the display will indicate that the 26V selection was STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will return the display to 5 V COMPLIANCE LIMIT.

Fourth option in the display will be 16V. An * indicates this option is selected. If not, press [ENTER] to select or scroll to next option.

When pressing [ENTER] the display will indicate that the 16V selection was STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will return the display to 5 V COMPLIANCE LIMIT.

Scroll to continue to another MENU ITEM or scroll to ENTER TO EXIT MENU to return to local operation.



2.7.6 Menu 6 - Power-On Set-Up

The 526 provides the ability to set the power on condition to either Factory Default or the Last LCL Setting when the unit was turned off. A *RST command does not store the last setting.

The Factory Default settings are:

MODE: LCL

MEMORY: 01

COMM PORT: IEEE-488 (GPIB), bus address default is 09.

VOLTAGE LIMITS: +112V and -112V

CURRENT LIMITS: +112mA and -112mA

COMPLIANCE LIMIT: 120V

SENSE WIRES: 2-Wire

OUTPUT SETTING: 00.0000mV

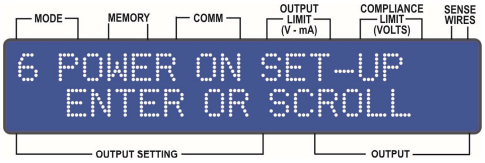
OUTPUT: ACTIVE

DISPLAY AREA: FULL PASS THRU

ZERO: ON

REMOTE PROTOCOL: KH 526

2.7.6.1 Changing Power-On Set-Up Setting



From the Menu Function, scroll to 6 POWER ON SET-UP. Press [ENTER].

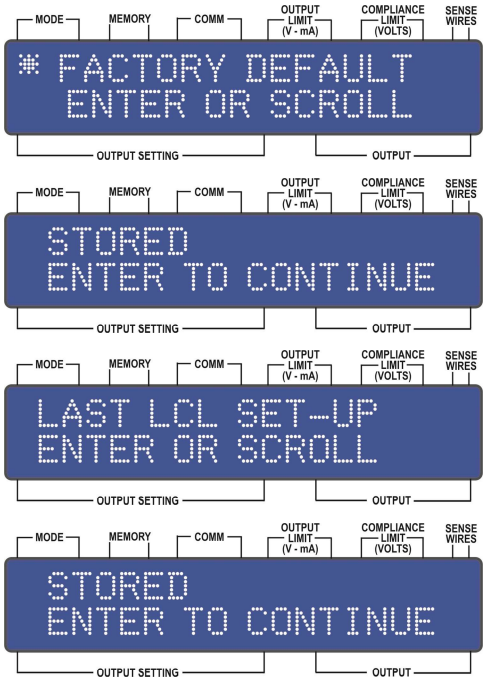
First option in the display will be FACTORY DEFAULTS. An * indicates this option is selected. If not, press [ENTER] to select or scroll to next option.

When pressing [ENTER] the display will indicate that the selection was STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will return the display to 6 POWER ON SET-UP.

Second option is LAST LCL SET-UP. An * indicates this option is selected. If not, press [ENTER] to select or scroll to next option.

When pressing [ENTER] the display will indicate that the selection was STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will return the display to 6 POWER ON SET-UP.

Scroll to continue to another MENU ITEM or scroll to ENTER TO EXIT MENU to return to local operation.



2.7.7 Menu 7 - Display Area

The 526 provides for full and partial display selection. Figures 2.4 and 2.5 below show the area displayed for each setting.

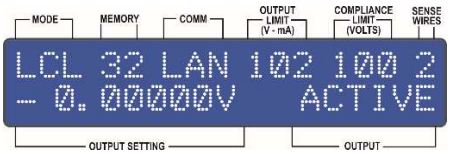


Figure 2.4 Full Display

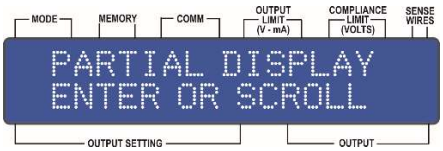
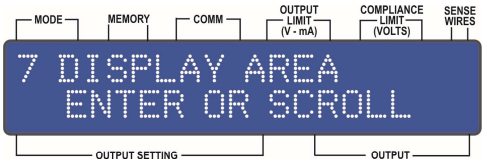


Figure 2.5 Partial Display

2.7.7.1 Changing Display Area Setting



From the Menu Function, scroll to 7 DISPLAY AREA. Press [ENTER].

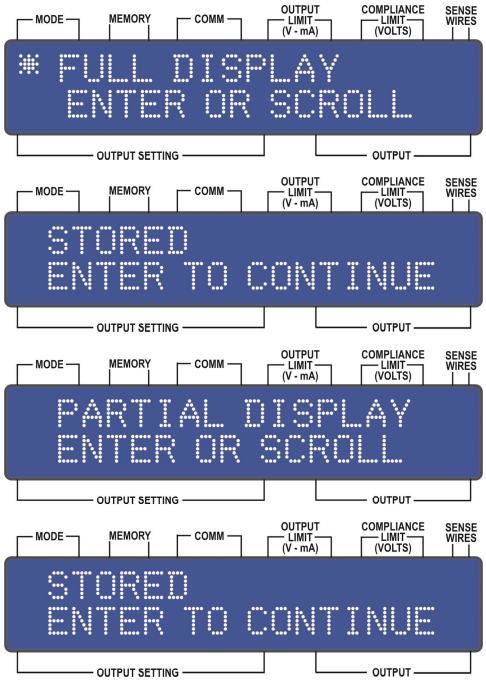
First option in the display will be FULL DISPLAY. An * indicates this option is selected. If not, press [ENTER] to select or scroll to next option.

When pressing [ENTER] the display will indicate that the selection was STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will store the selection and return the display to 7 DISPLAY AREA.

Second option is PARTIAL DISPLAY. An * indicates this option is selected. If not, press
[ENTER] to select or scroll to next option.

When [ENTER] is pressed, the display will indicate that the selection was STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will store the selection and return the display to 7 DISPLAY AREA.

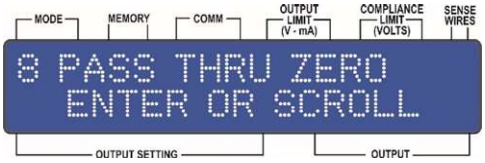
Scroll to continue to another MENU ITEM or scroll to ENTER TO EXIT MENU to return to local operation.



2.7.8 Menu 8 - Pass Thru Zero

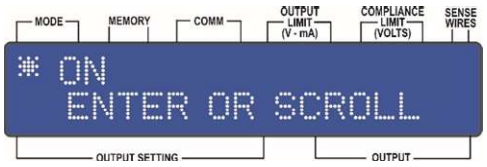
Pass Thru Zero allows the 526 decade controls to pass through zero. When turning a decade control from a plus voltage/current through zero to a negative voltage/current, changing polarity is not required. This allows a user to work around zero and not have to stop to make a polarity change.

2.7.8.1 Changing Pass Thru Zero Setting

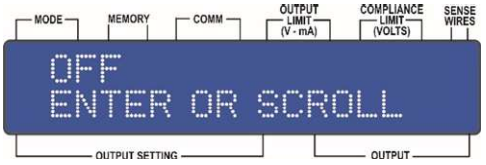


From the Menu Function, scroll to 8 PASS THRU ZERO. Press [ENTER].

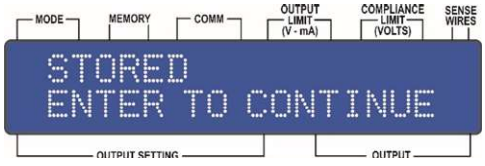
First option in the display will be ON. An * indicates this option is selected. If not, press [ENTER] to select or scroll to next option.



When pressing [ENTER] the display will indicate that the selection was STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will return the display to 8 PASS THRU ZERO.

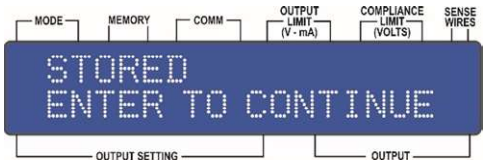


Second option is OFF. An * indicates this option is selected. If not, press [ENTER] to select or scroll to next option. Pressing [ENTER] will return Menu to 8 PASS THRU ZERO.



When pressing [ENTER] the display will indicate that the selection was STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will return the display to 8 PASS THRU ZERO.

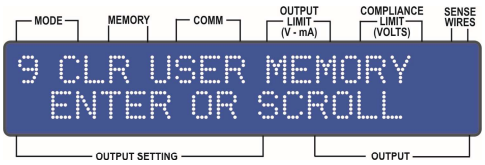
Scroll to continue to another MENU ITEM or scroll to ENTER TO EXIT MENU to return to local operation.



2.7.9 Menu 9 - CLR User Memory

Clear User Memory is provided for a global reset of all memory locations. Clearing User Memory sets the OUTPUT SETTING to +00.0000mV, the OUTPUT to CROWBAR and the SENSE WIRES selection to 2 WIRE. All other 526 settings are not saved in the user memory area and can only be changed from the MENU mode.

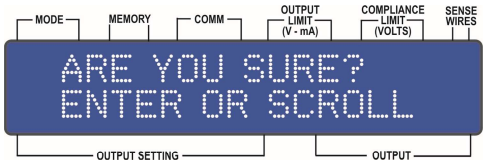
2.7.9.1 Clearing User Memory

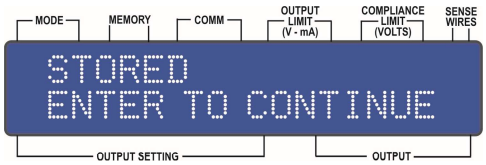


From the Menu Function, scroll to 9 CLR USER MEMORY. Press [ENTER].

ARE YOU SURE? will appear. Press [ENTER] to select or scroll to next option. Pressing [ENTER] will erase all user memory and the display will indicate that the selection was STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will return the display to 9 CLEAR USER MEMORY.

Scroll to continue to another MENU ITEM or scroll to ENTER TO EXIT MENU to return to local operation.





2.7.10 Menu 10 - Remote Protocol

The 526 Remote Protocol can be set to three models, KH 526 (which is the same protocol as the KH 522-RA7 models), KH 522 and Analogic/DP 8200.

The KH 526 Protocol allows users to use existing protocol used in programs developed for the older Krohn-Hite Model 522-RA7 and is the standard protocol for the 526.

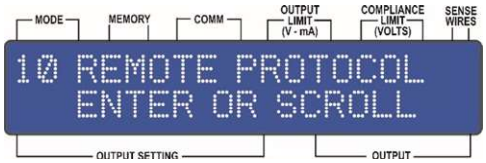
The KH 522 Protocol allows users to use existing protocol used in programs developed for the older Krohn-Hite Model 522.

The Analogic/DP Protocol allows the user to use existing protocol in programs developed for the Analogic/Data Precision Model 8200. See Note below.

If you have an older model 522 that was modified and has special firmware, contact factory, the Protocol may not be compatible.

NOTE: In 8200 mode, there are no output or compliance limits. Any limits set in LCL mode only work in LCL mode.

2.7.11 Changing Remote Protocol Setting



From the Menu Function, scroll to 10 REMOTE PROTOCOL. Press [ENTER].

First option in the display will be KH 526 PROTOCOL. An * indicates this option is selected. If not, press [ENTER] to select or scroll to next option.

When pressing [ENTER] the display will indicate that the selection was STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will return the display to 10 REMOTE PROTOCOL.

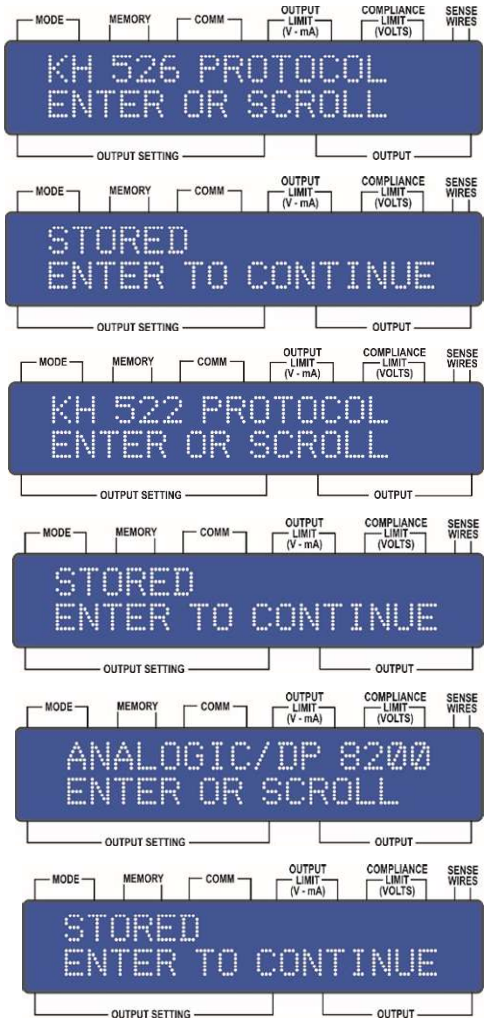
Second option is KH 522 PROTOCOL. An * indicates this option is selected. If not, press
[ENTER] to select or scroll to next option.

When pressing [ENTER] the display will indicate that the selection was STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will return the display to 10 REMOTE PROTOCOL.

Third option is ANALOGIC/DP 8200. An * indicates this option is selected. If not, press [ENTER] to select or scroll to next option.

When pressing [ENTER] the display will indicate that the selection was STORED and to press ENTER TO CONTINUE. Pressing [ENTER] will return the display to 10 REMOTE PROTOCOL.

Scroll to continue to another MENU ITEM or scroll to ENTER TO EXIT MENU to return to local operation.



2.8 Overloading

When the 526 is placed in an overload condition, it will place the output into a CROWBAR state, preventing any damage that may occur. Removing the overload condition will allow the unit to return to ACTIVE mode.

[CROWBAR] must be pressed in the local mode or data must be received in the remote mode to clear the CROWBAR condition.

NOTES

SECTION 3

Model 526 (STD) GPIB Programming

3.1 Introduction

The GPIB makes it possible for a user to connect various instruments and components together into a functional system. However, this system will not work without the proper software. The remote driver for communication offers a set of functions and commands which the user can assemble into a written program. Once written, the user's application program, in conjunction with the driver, will allow the various instruments on the GPIB to generate signals, take measurements, and allow the instrument controller to manage the resulting information.

The remote programming protocol of the 526 is unique in that it is compatible with the Krohn-Hite Model 522-RA7, 522 and Analogic/Data Precision Model 8200. This allows anyone with these older instruments the ability to replace them with the 526 without having to make changes to existing programs. The standard protocol of the 526 is KH 526 PROTOCOL, which is the same as the Model 522-RA7. Each protocol can be simply changed by way of the REMOTE PROTOCOL Menu. Selections are KH 526, KH 522 and Analogic/DP.

All commands sent over the GPIB/LAN must be expressed ASCII Commands. There are three steps that MUST be taken when using the GPIB/LAN to make the system operate.

The user MUST:

a. Understand what tasks must be performed.
b. Use the controller's language.
c. Know what kind of information the instruments are capable of exchanging.

NOTE: *READ THE CONTROLLER PROGRAMMING MANUAL THOROUGHLY!*

When the 526 is in Talker Mode, it will assert the EOI line with the last character sent.

3.2 Krohn-Hite (Std) Programming Protocols

The remote programming protocol of the 526 is unique in that itis compatible with the Krohn-Hite Model 522, 522-RA7 and Analogic/Data Precision Model 8200. This allows anyone with these older units the ability to replace them with the 526 without having to make changes to existing programs.

To select the protocol for KH 526 PROTOCOL, do the following:

Press [MENU], then using the Selector Knob, scroll to 10 REMOTE PROTOCOL and press [ENTER].

The first selection in the display will be KH 526 PROTOCOL. If there is an asterisk next to KH 526 PROTOCOL in the display, this protocol is selected; if not, press [ENTER]. The display will then indicate STORED, ENTER TO CONTINUE. Press [ENTER] to return to 10 REMOTE PROTOCOL. To verify that the 526 is now in the right mode press [ENTER]again, the asterisk (*) should be next to KH 526 PROTOCOL (*KH 526 PROTOCOL).

Repeat the same for each protocol desired.

NOTE: *The 526 should see an eight 8 or 9-character word for correct programming. It will act on the first 8 bytes. The 526 must receive an end of message terminator to act on the message. It will recognize CR LF, LF or EOI with the last byte as a terminator.*

3.3 IEEE-488 (GPIB) Programming

3.3.1 Interface Capabilities

SH1, AH1, T6, L4, SR1, RL0, PP1, DC0, DT0, E1.

3.3.2 Setting The Instrument's Address

The Model 526 is both a "Listener and a limited Talker" instrument. The address is set from the Port Selection Menu. See Section 2.7.2.

3.3.3 Interface Messages

The Model 526 will respond to the following interface messages:

3.3.3.1 "MLA" - My Listen Address.

Upon receipt of this message, the instrument will enter its listener active state and be ready to accept a string of data bytes. ATN must be true.

3.3.3.2 "MTA" - My Talk Address

Upon receipt of this message, the instrument will enter it's Talk state and transmit a message string as defined in Section 3.3.6.

3.3.3.3 "UNL" Unlisten

Upon receipt of this message, the instrument will enter its listener idle state and will not listen to any subsequent data byte strings. ATN must be true.

3.3.3.4 "IFC" Interface Clear

Upon receipt of this command the instrument will enter its listener idle state.

3.3.3.5 "Power-On" Clear

On "Power-On", and remote mode, the instrument will be in the listener idle state and its analog output will be 0. The instrument will also go to its listener idle state when in the local mode.

3.3.4 Group Commands

There are several groups of commands which the 526 will act upon when received over the bus.

A. Normal messages to program the unit's output to a specified voltage.
B. Messages requesting specific responses on the condition of the 526.
C. Serial Poll in response to a SRQ.
D. Parallel Poll to indicate device status.
E. Interface Clear (IFC).
F. Status of the unit.
G. Compliance Limit
H. Power-Up Reset to factory defaults
I. Set memory locations

Protocol			Command	Syntax	Range
526	522	8200			
x	-	-	Status Query	S or s	-
x	-	-	Set Compliance Limit	C or c	120V, 36V, 26V, 16V
x	x	-	Power-Up Reset	*RST or *rst	-
x	-	-	Set Memory	M or m	-
x	-	-	Set Limits	L or l	1V to 112V
x	x	-	ID Identification Query	*IDN?, *idn?, ID? or id?	-
-	x	-	Last Instruction Sent	B or b	-
x	x	-	What is Wrong Query	?	-
x = Supported					

Table 3.1 - ASCII Commands

3.3.5 Output Data Byte String Format

In general, the 526 is programmed with an 8 or 9-character data byte string.

ATN must be false on these bytes.

Standard 526 Protocol

Character	Function	ASCII Codes
1	Polarity	+ = Positive Polarity 0 = Crowbar - = Negative Polarity
2	MSD	0 to 10 (for decimal 10, use "J"
3	2SD	0 to 10 (for decimal 10, use "J"
4	3SD	0 to 10 (for decimal 10, use "J"
5	4SD	0 to 10 (for decimal 10, use "J"
6	5SD	0 to 10 (for decimal 10, use "J"
7	6SD	0 to 10 (for decimal 10, use "J"
8	Range	0 = 100mV 1 = 1V 2 = 10V 3 = 100V 4 = 10mA 5 = 100mA
9 (optional)	Sense	2 = 2-Wire Mode 4 = 4-Wire Mode (remote sense)

In the voltage mode, the Model 526 will default to remote sense (4-wire mode) unless the 9th character is a 2.

The analog output will change to a new value after receiving the end of message.

NOTE: *Optional in Krohn-Hite protocol mode, is a 2 or 4 can be added to the data string as the 9th character that will allow 2 wire mode to be enabled.*

Example 1: Send +J0000022 (+10V, 2-wire)
Example 2: Send -50000014 (-0.5V, 4-wire)
Example 3: Send +10000044 (+10mA, 2-wire) only 2-wire mode is allowed in the mA ranges.

Table 3.2 - 526 Standard Protocol

NOTE: *All examples shown, are characters sent as ASCII string characters entered into a program or interface routine that handles outputting to a GPIB interface board.*

3.3.5.1 Examples of Data Strings and Output Results using Standard 526 Protocol

Example	String	Length of String	Result
1	+J0000022	9	+10.00000 volts, local sense 2W.
2	012345604	9	The 526 output crowbar is turned on.
3	-5000003	8	-50.0000 volts, remote sense 4W.
4	-JJJJJJ0	8	-111.1110mV, remote sense 4W.
5	+00000004	9	+00.0000mV, remote sense 4W.
6	+9999995	8	+99.9999mA, local sense 2W.

Table 3.3 - Data Strings and Output Result Examples

NOTE: *If the remote voltage or current sent exceeds the voltage/current limit, the output will not change.? will return DATA ERROR. SRQ error returns an "A", it is a DATA ERROR. If it returns a "B", it is an OUTPUT OVERLOAD.*

3.3.6 Talk Enable Modes

The controller may request specific status information from the MODEL 526. The queries to be sent to the MODEL 526 prior to sending an MTA are as follows:

Status: S or s
Identification query: *IDN? or ID? (eoi), see section 3.3.7.5
What's wrong: ? (eoi), see section 3.3.7.7

Upon receipt of any of the above messages, and upon receipt of MTA, the MODEL 526 will respond with the appropriate information.

3.3.7 C or c (Compliance Limit)

Use this command to set the Compliance Limit remotely.
String possibilities are:
C120 or c120 for 120V
C036 or c036 for 36V
C026 or c026 for 26V
C016 or c016 for 16V

Example: C036 will limit the compliance voltage to 36 volts.

Any other data sent will return a data error.

3.3.8 *RST or *rst (Power-Up Reset)

Resets the unit to Factory Defaults settings (see para 2.7.6). Last settings are not stored.

3.3.9 S or s (Status)

Returns the set-up condition of the unit. The status will be represented by a 48-character string with a comma delimiter indicating the current remote setting, including range, 2-wire/4-wire and active or crowbar; port setting; +V limit; -V limit; +I limit; -I limit; compliance limit; memory address (1 to 32); and memory setting.

Example 1 of returned string: +10000012A,488,110,110,110,110,120,01,+12345612A

Example 2 of returned string: -10000034C,488,050,050,020,020,120,21,+10000034C

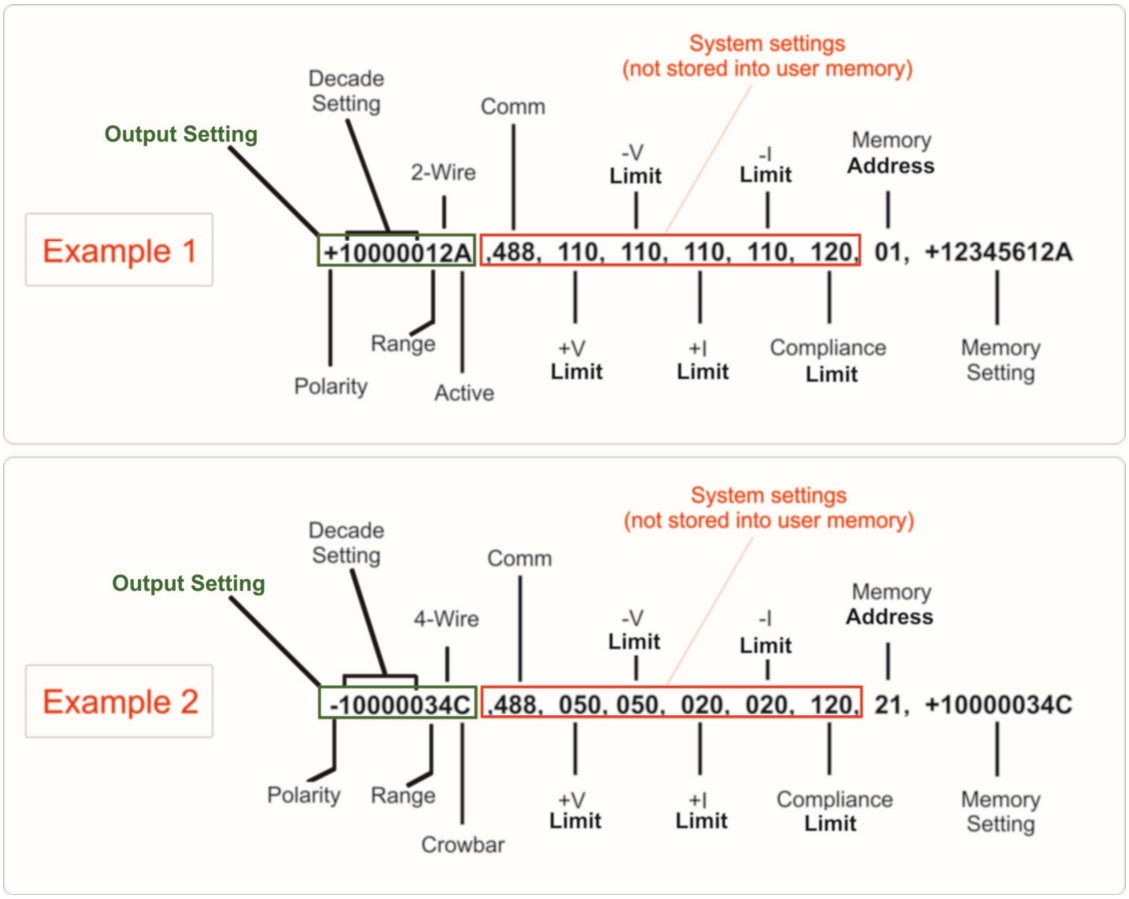


Figure 3.4 - Return String Information

Status Message Format			
Character Position	**String Information**		**Returned Value**
0		Polarity	+ = Positive Polarity 0 = Crowbar - = Negative Polarity
1 thru 6		Decade Setting	0 to 10 ("J" is used for 10)
7		Range	0 = 100mV 1 = 1V 2 = 10V 3 = 100V 4 = 10mA 5 = 100mA
8		Output Terminals 2 or 4-Wire	2 or 4
9		Active or Crowbar	A or C
10	Delimiter		,
11 thru 13	Port Selection		488 or LAN
14	Delimiter		,
15 thru 17	+ V Limit	Volts Limit	000 to 110
18	Delimiter		,
19 thru 21	-V Limit	Volts Limit	000 to 110
22	Delimiter		,
23 thru 25	+I Limit	Current Limit	000 to 110
26	Delimiter		,
27 thru 29	-I Limit	Current Limit	000 to 110
30	Delimiter		,
31 thru 33	Compliance Limit	120V, 36V, 26V, 16V	120, 036, 026, 016
34	Delimiter		,
35 thru 36	Memory Address		01 to 32
37	Delimiter		,
38	Memory Setting	Polarity	+ = Positive Polarity - = Negative Polarity
39 thru 44		Decade Setting	0 to 10 ("J" is used for 10)
45		Range	0 = 100mV 1 = 1V 2 = 10V 3 = 100V 4 = 10mA 5 = 100mA
46		Output Terminals, 2 or 4-Wire	2 or 4
47		Active or Crowbar	A or C

Table 3.5 - Status Message Format

3.3.10 M or m (Set Memory)

Memory location can be remotely set using this command.

Syntax: M32+12345612A, this will store +1.23456 volts with a 2-wire sense and with the output active in memory location 32.

String Characters	Setting	No. of Characters	Range
M32	Memory location	3	1 through 32
+	Polarity	1	+, -
123456	Decades setting	6	0 through 10
1	Range	1	1 through 5
2	Sense	1	2 (2-wire), 4 (4-wire)
A	Output Active	1	A (active) or C (crowbar)

Table 3.6 - Memory Syntax

3.3.11 L or l (Output Limit)

Output voltage and current limits can be set using this command. Ranges are 0V to 112V or 0mAto 112mA.

Syntax: L+050V (sets + voltage limit to 50V.) L-005i (sets - current limit to 5mA.)

3.3.12 *IDN? or *idn?

This command requests the 526 to identify itself; followed by a request to talk, it will respond with:

Returns instrument model number, firmware version number and remote protocol setting:

"KROHN-HITE 526, VER 1.00, KH526 PROTOCOL"

NOTE: ID? is compatible with the Model 522.

3.3.13 ? (What's Wrong Query)

The 526 may be serial polled or remotely configured for parallel polling. After determining that the 526 is the requesting instrument, sending a ?, followed by a request to talk will produce a brief description of the offending condition. In addition, the serial poll initial response byte indicates what type of condition caused the request. The 526 will return one or more of the following ASCII messages:

“DATA ERROR”
“OVERLOAD”
“NOTHING WRONG”

3.3.14 "What’s Wrong" Request

("?") may be sent at any time, the MODEL 526 will respond with, “NOTHING WRONG” or one of the messages of Section 3.3.7.8. It is also used when the controller responds to an SRQ and the 526 response signifies an error condition.

The Model 526 sets the SRQ when an error is detected. The "What's Wrong" request, (”?"), when sent will clear the SRQ.

3.3.15 Programming Examples

The following sample programs are intended as guides to help you program the Model 526.

NOTE: *The 526 should see an eight 8 or 9-character word for correct programming. It will act on the first 8 bytes. The 526 must receive an end of message terminator to act on the message. It will recognize CR LF, LF or EOI with the last byte as a terminator.*

The LANGUAGE is in BASIC, unless noted.
The INTERFACE is IEEE-488 (GPIB)

SAMPLE PROGRAM - The following sample program is intended as a guide to help you program this calibrator.

```
'Manual input program for 526.  BUS ADDRESS = 5
PRINT CLS 'Clear the screen
ED$= " "
PRINT ED$: PRINT "ENTER POLARITY + OR - "
INPUT P$
PRINT CLS
PRINT"    ENTER MAGNITUDE IN SIX CHARACTERS; IE, 123456"
PRINT" FOR DECIMAL 10 USE  J":PRINT" "   ' Use J00000 for full scale
PRINT CLS
PRINT" ENTER RANGE":PRINT"0 FOR 100 mV":PRINT"1 FOR 1V"
PRINT"2 FOR 10V"
PRINT"3 FOR 100V":PRINT"4 FOR 10MA":PRINT"5 FOR 100MA"
PRINT CLS
A$=(P$+M$+R$) 'data string sent to 526'
PRINT"":PRINT"     INPUT SENT TO 526 ON THE BUS IS "; A$
T$=CHR$(13)
OPEN 5,5
WRT7XX,A$; CHR$(13)  'Send the string to 526
CLOSE 5
PRINT"INPUT COMPLETE":PRINT"":PRINT""
END
```

NOTES

SECTION 4

Model 520/521/522 GPIB Remote Programming Emulation

4.1 Introduction

The Model 526 is unique from other calibrators in that it has the ability to emulate and operating remotely as one of the older Models 520, 521 and 522 DC Voltage/Current Calibrator.

NOTE: *Does not support units with RA-7 option (1V option). Use the 526 in its native mode for units with these options. Units with RA-5 1000V option are not supported at all.*

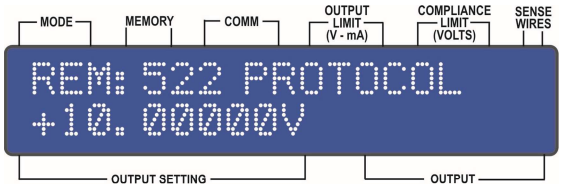
NOTE: *LAN (Local Area Network) is not supported when set for the 522 Protocol Mode.*

To set the unit to the Model 522 Protocol, go to the protocol set-up in the MENU system(MENU 10), see page 2-28. Once set, the Model 526 can use the same programs written for the Model 522.

4.2 IEEE-488 Programming Protocol

Address Setting: Refer to paragraph 3.3.2 to set the address of the 526.

When addressed to listen, and when sent a character, the 526 will assume REMOTE operation status. All front panel controls, with the exception of [LOCAL] will no longer respond. The 526 will retain its previous output setting until receipt of a valid character or string as described in the table below. When that occurs, the unit DISPLAY will indicate the following:



Model 522 Remote Protocol Range Bit Table

KH 520/521/522 Range Bit
0 = 100mV
1 = 10V
2 = 100V
3 = 1V optional
4 = 10mA
5 = 100mA

Table 4.1 - 520/521/522 Range Bit

4.2.1 Interface Messages.

The 522 Protocol will respond to the following interface messages:

"MLA". - My Listen Address.
Upon receipt of this message, the instrument will enter its listener active state and be ready to accept a string of data bytes. ATN must be true.

"MTA". - My Talk Address.
Upon receipt of this message, the instrument will enter it's Talk state and transmit a message string.

"UNL". Unlisten.
Upon receipt of this message, the instrument will enter its listener idle state and will not listen to any subsequent data byte strings. ATN must be true.

"IFC". Interface Clear.
Upon receipt of this command the instrument will enter its listener idle state.

"Power-On" Clear.
On "Power-On", and remote mode, the instrument will be in the listener idle state and its analog output will be 0. The instrument will also go to its listener idle state when in the local mode.

4.2.2 Groups of Commands

There are several groups of commands which the 526 (in 522 Protocol) will act upon, when received over the bus:

A. Normal messages to program the unit's output to a specified voltage.

B. Messages requesting specific responses on the condition of the unit.

C. Serial Poll in response to a SRQ.

D. Parallel Poll to indicate device status.

E. Interface Clear (IFC)

4.2.3 Talk Enable Modes

The controller may request specific status information from the 522 Protocol. The messages to be sent to the prior to sending an MTA are as follows:

Identification query: ID?(eoi)
Last Data Sent: B(eoi)
What's wrong: ?(eoi)

4.2.4 Responses

Upon receipt of any of the above messages, and upon receipt of MTA, the unit will respond with the appropriate information:

ID?: Returns instrument model number and firmware version number:

"KROHN-HITE, 526, VER 1.20, KH 522 PROTOCOL"

B: Eight (8) byte message string. (Consist of first eight bytes received over the bus, regardless of message length in excess of eight.)

?: One or more of the following ASCII messages:

"DATA ERROR"
"OVERLOAD"
"NOTHING WRONG"

4.2.5 Data Byte String Format.

In general, the 522 Protocol is programmed with an 8-character data byte string. ATN must be false on these bytes.

Character Function ASCII Codes

CHARACTER	FUNCTION	ASCII CODE
1	Polarity	+ = Positive Polarity 0 = Crowbar "0" - = Negative Polarity
2	MSD	0 - 10 (For Decimal 10 Use "J")
3	2SD	0 - 10 (For Decimal 10 Use "J")
4	3SD	0 - 10 (For Decimal 10 Use "J")
5	4SD	0 - 10 (For Decimal 10 Use "J")
6	5SD	0 - 10 (For Decimal 10 Use "J")
7	6SD	0 - 10 (For Decimal 10 Use "J")
8 EOI	Range	0 = 100mV 1 = 10V 2 = 100V 4 = 10mA 5 = 100mA CR LF or LF if EOI has not been sent
The analog output will change to a new value after receiving the end of message.		

Table 4.2 - Character Function ASCII Code

Voltage	String
+100mV	+J000000
+5V	+5000001
+10V	+J000001
+50V	+5000002
+110V	+JJ00002
Voltage	**String**
+1mA	+1000004
+10mA	+J000004
+100mA	+J000005

Voltage	String
-20mV	-2000000
-1V	-1000001
-2V	-200001
-75V	-7500002
-100V	-J000002
Voltage	**String**
-5mA	-5000004
-40mA	-4000004
-75mA	-7500005

Table 4.8 - Examples of Character Strings for Setting Voltage and Current

NOTE: *The 522 Protocol should see an eight, (8) character word for correct programming. It will act on the first 8 bytes. The 522 Protocol must receive an end of message terminator to act on the message. It will recognize CR LF, LF, OR EOI with the last byte as a terminator.*

4.2.6 What's wrong request, ("?")

The "What's wrong request, ("?"), may be sent at any time, the MODEL 522 will respond with, "NOTHING WRONG" or one of the messages of Para 3.4.4.3. It is also used when the controller responds to an SRQ and the 522 response signifies an error condition.

The Model 522 sets the SRQ when an error is detected. The "What's wrong request, ("?"), when sent will clear the SRQ.

4.2.7 Programming

The following sample programs are intended as guides to help you program this calibrator.

NOTE: the 526 (522 Protocol mode) should see an eight, (8) character word for correct programming. It will act on the first 8 bytes. The unit must receive an end of message terminator to act on the message.

It will recognize CR LF, LF or EOI with the last byte as a terminator.

The LANGUAGE is in BASIC, unless noted; INTERFACE is IEEE-488 (GPIB) and the ADDRESS is (Binary) 5.

```
1 REM MANUAL INPUT PROGRAM FOR KH 522
5 PRINT"{clr home}"
6 ED$="
10 PRINTED$:PRINT"":PRINT"ENTER POLARITY + OR -"
20 INPUT P$
25 PRINT"{clr home}"
30 PRINT" ENTER MAGNITUDE IN SIX CHARACTERS; IE, 123456"
31 PRINT" FOR DECIMAL 10 USE J":PRINT""
40 INPUT M$:IF LEN(M$)6 GOTO30
45 PRINT"{clr home}":PRINTED$:PRINT""
50 PRINT" ENTER RANGE":PRINT"0 FOR 100 MV":PRINT"1 FOR 10V"
51 PRINT"2 FOR 100V"
52 PRINT"4 FOR 10MA":PRINT"5 FOR 100MA"
```

```
60 INPUT R$: IF LEN®$)1 GOTO50 65 PRINT"{clr home}":PRINTED$:
70 A$=(P$+M$+R$)
72 REM A$ IS DATA MESSAGE SENT ON THE BUS TO 522
75 PRINT"":PRINT" INPUT TO 522 ON THE BUS IS A$, A$="A$
100 T$=CHR$(13)
110 OPEN5,5
120 WRT7XX,A$; CHR$(13):REM-OR WRT7XX,"T123456R";CHR$(13);
130 CLOSE5
135 PRINT"INPUT COMPLETE":PRINT"":PRINT""
140 PRINT"TO ENTER MORE DATA, PRESS SPACE BAR":PRINT""
150 GETX$:IFX$=""THEN150 160 GOTO5
```

4.2.8 IEEE-488 Addressing

Address Setting: Refer to paragraph 3.3.2 to set the address of the 526.

NOTES

SECTION 5

8200 GPIB Remote Programming Emulation

5.1 Analogic/Data Precision Protocol

Another unique feature of the Model 526 is that can emulate the remote programming protocol of the ANALOGIC/DATA PRECISION 8200. Any programs written for the Model 8200 will work with the Model 526.

NOTE: *LAN (Local Area Network) is not supported when set for the 8200 Protocol Mode.*

When addressed to listen, and when sent a character, the 526 will assume REMOTE operation status. All front panel controls, with the exception of [LOCAL] will no longer respond. The 526 will retain its previous output setting until receipt of a valid character or string as described in the table below.

Sending an "L" at any time, pressing [LOCAL] or turning the unit off/on, will return the 526 to the local mode. Character strings are all ASCII. Parity bit is ignored. Once a V or A is received, the string must conform to the Analog/DP 8200 protocol. Receipt of the last character in the string initiates an output.

When the 526 is set to ANALOGIC/DP 8200 PROTOCOL, nulls, periods and/or spaces will be ignored. It will only respond to the first 10 valid characters in any string for voltage and 8 characters for current.

	Character Position	Character	Description	Comment
Voltage Mode	1	V	voltage mode	
	2	0 1 2 3	100mV range 10V range 100V range 1000V range	Not available
	3	+ -	Plus polarity Minus polarity	
	4 thru 10	0 to 9	Magnitude	NUL, ., or SPACE is ignored after polarity is received.
Current Mode	1	A	100mA range	
	2	+ -	Plus polarity Minus polarity	
	3 thru 8	0 to 9	Magnitude	NUL, ., or SPACE is ignored after polarity is received.
Characters received before a V or A are ignored. Once the V or A is received, the string must conform to the format specified above.				

Table 5.1 - Table of Character String Syntax

Out of range values will be ignored and do not cause a zero output. The 526 will also respond to a *IDN? as in the KH 526 Protocol.

5.1.1 8200 Protocol Programming Examples

Desired Setting	String to be Sent		Desired Setting	String to be Sent
Voltage			**Current**	
+5.12345V	V1+0512345		+20mA	A+020000
-5.12345V	V1-0512345		-50mA	A-050000
+65.12345V	V2+0651234		+30mA	A+030000
-87.12345V	V2-0871234		-100mA	A-100000

Table 5.2 - Example of Voltage and Current Strings

NOTE: *The only exception to this would be if a program is written for the 8200 that disconnects the front panel terminals to the rear panel terminals by switching the range to mV. The Model 8200 was designed to move the terminals to the rear when in the mV range. The 526 does not switch terminals.*

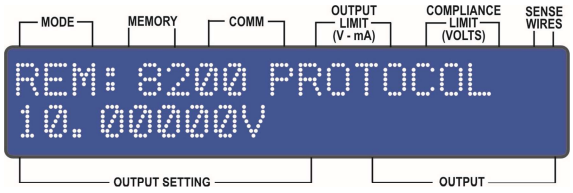
To select the protocol for ANALOGIC/DATA PRECISION 8200 do the following:

Press [MENU], then using the Selector Knob, scroll to 10 REMOTE PROTOCOL and press [ENTER].

The first selection in the display will be KROHN-HITE. Turn the Selector Knob again and select ANALOGIC/DP 8200. If there is an asterisk next to ANALOGIC/DP 8200 in the display, the ANALOGIC/DP 8200 protocol is selected; if not, press [ENTER]. The display will then return to 10 REMOTE PROTOCOL. To verify that the 526 is now in the right mode, press [ENTER] again. Krohn-Hite will be in the display, but with no asterisk. Turn the Selector Knob to Analogic/DP 8200 and the asterisk should appear in the display.

5.1.2 Address Setting (refer to paragraph 3.3.2 to set the address of the 526)

When addressed to listen, and when sent a character, the 526 will assume REMOTE operation status. All front panel controls, with the exception of [LOCAL] will no longer respond. The 526 will retain its previous output setting until receipt of a valid character or string as described in the table below. When that occurs, the unit DISPLAY will indicate the following:



5.1.3 2-Wire/4-Wire Operation

The ANALOGIC/DP 8200 protocol allows for only 4-Wire operation. If you are operating in 2-wire mode, use shorting links to connect the HI terminals together and the LO terminals together.

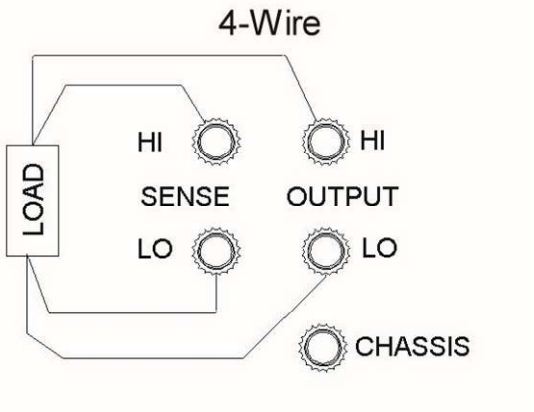


Figure 5.1 - 2-Wire/4-Wire Connection

NOTES

SECTION 6

LAN (Local Area Network) Operation

6.1 Introduction

The following information will give suggested steps to get quickly started connecting, configuring and using the Model 526 on a LAN Network, Private Network or connecting directly to your PC.

6.2 Local Area Networks

6.2.1 Site LANs and Private LANs

A Site LAN is a local area network (LAN) in which LAN-enabled instruments and Windows PCs are connected through a site LAN (workgroup LAN, Intranet, or Enterprise LAN) via a router, hub, or switch. A Private LAN is a local area network in which LAN-enabled instruments and Windows PCs are NOT connected to a site LAN.

6.2.2 Connecting Through a Network

To use the Model 526 through a network, a straight through CAT5e cable must be used to connect the 526 to the network. The remote control setting of the 526 must also be set to LAN from the Port Selection Menu. The default setting for the IP address is set to obtain the address via DHCP. Connect the 526 to the network and turn it on. After a moment, your DHCP (Dynamic Host Configuration Protocol) server should assign a valid address automatically. Start HyperTerminal and configure it if needed. See Section 3.4.4.1.

6.2.3 Connecting Directly to the Model 526 (no network)

To use the Model 526 directly connected to a computer and not through a network, a crossover CAT5e cable must be used to connect the 526 to the network card of the computer. Connect the 526 directly to the network first and then power it on. After a moment your computer should assign an IP address to the Model 526, if it is set to obtain IP addresses automatically (default setting). Use the supplied LANScan program, (see Section 3.4.2) if needed, to find the IP address of the local computer or the Model 526. See Section 3.4.4.2 for using Hyper Terminal to communicate with the 526. Section 3.4.4.1 covers basic set-up configurations for Hyper Terminal.

NOTE: *The remote control setting of the 526 must also be set to LAN from the Port Selection Menu (see Section 2.7.2).*

6.2.4 How to Find the Current IP Address:

Connect the correct network cable to the model 526 before turning the 526 on. For a direct connection setup, use a CAT5e Crossover Cable. Otherwise use a Standard Cat5e Straight Cable.

Run the Krohn-Hite supplied LANScan program. This program will scan your local network to find the current IP Address of all the 526's. This is a stand-alone program that will run from a flash drive or the Krohn-Hite Manual CD that was packed with the 526.

Upon starting the program, the following window, Figure 4.1, displays. Click **Run**. The program displays its main window, Figure 6.2.



Figure 6.1 - Windows XP Security Window

The window shown in Figure 6.2 is the opening window for the LANScan program.



Figure 6.2 - Opening LanScan Window

In this example, the computer running the LANScan program has an IP address of 192.168.1.103. Click the **Search** button near the bottom of the window to start scanning. The following figure shows the results of the scan.



Figure 6.3 - LanScan Search Result

In this example, there is one 526 with an IP Address of 192.168.1.117. If more than one 526 is on the network, you can use the MAC Address to identify the calibrator of interest. See Section 2, Paragraph 2.7.1.1 of this manual for instructions on displaying the MAC Address on the front panel.

6.2.5 Setting a Fixed IP Address

First, connect the correct network cable to the model 526 before turning the 526 on. For a direct connection setup, use a CAT5e Crossover Cable, otherwise use a standard CAT5e Straight Through Cable.

Run the LANScan program to find the current IP address of the 526.

NOTE: *LANScan is provided on the CD that came with the 526 (Manuals CD), or it can be found on our web site home page www.krohn-hite.com located under Software.*

Once the IP address is found, using a browser like Internet Explorer, type in the 526 address in the address bar. A dialog box will appear prompting for a User name and Password (see Figure 6.4). If no password has been defined (default) then leave both fields blank and click "OK". If a password has been defined, leave the username blank, type in the password, and click "OK".



Figure 6.4 - Security User Name and Password

After the Security box information has been entered, the Device Server Configuration Manager will display (see Figure 6.5).

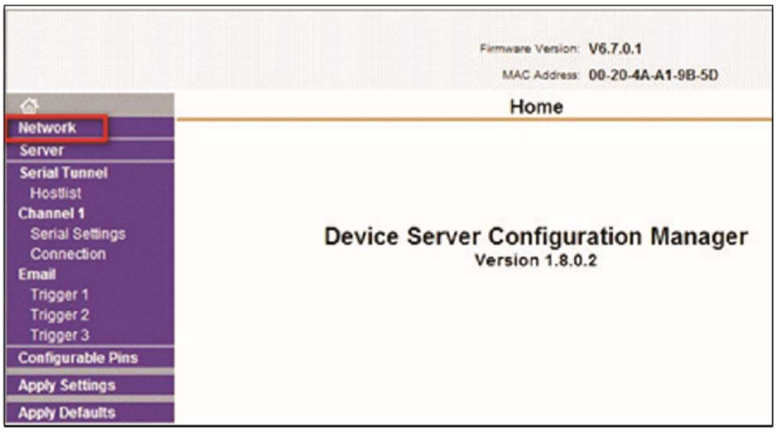


Figure 6.5 - Device Server Configuration Manager

On the main menu in the left side of the window, click Network (highlighted in red above) and the following page will display.

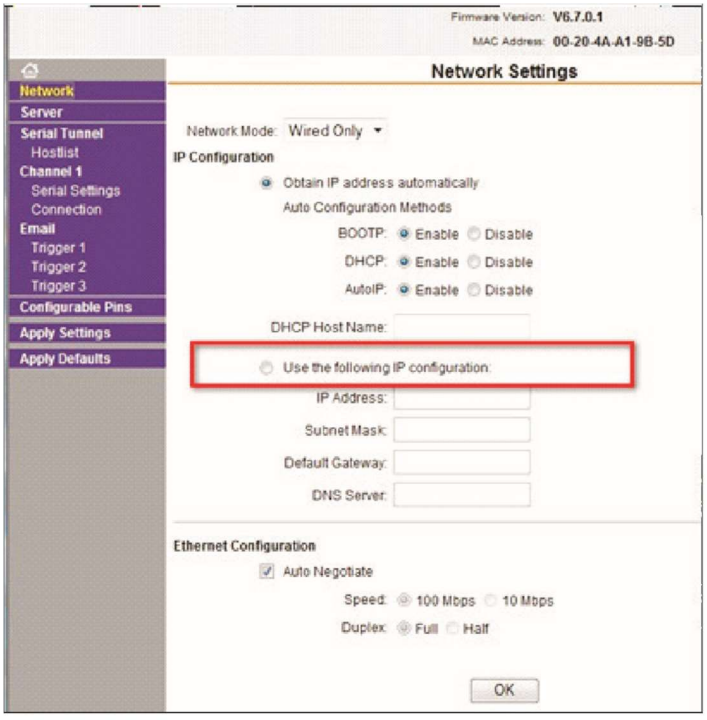


Figure 6.6 - Network Settings Screen

Click on the **Use the following IP configuration** radio button (highlighted in the red above).

Enter the **IP address**, Subnet mask and Default gateway (the gateway parameter is optional) you want to assign to the 526. Typical subnet for most local networks would be (255.255.255.0). Then click **"OK"** (highlighted in red below) at the bottom of the window**.**

Assign address 192.168.1.147 with a subnet Mask of 255.255.255.0.

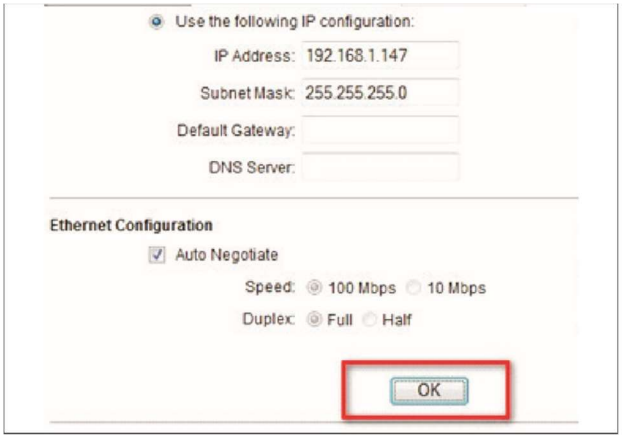


Figure 6.7 - IP Addressing Screen

On the main menu in the left side, click **Apply Settings** (highlighted red below). After about five seconds the window will inform you that the 526 LAN is rebooting in order to apply the settings.

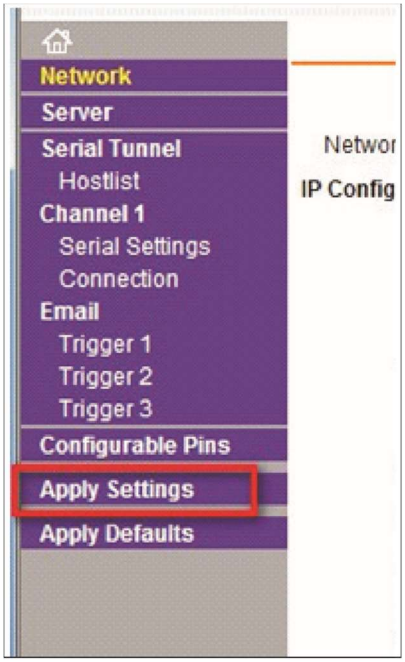


Figure 6.8 - Apply Settings

Close the browser when done.

6.2.6 LAN and HyperTerminal Setup

When connecting the 526 to a network or computer directly, check the communication port setting of the 526 (Section 2.7.2, Menu Item 2). If not, change the setting for LAN operation.

In order to use the Krohn-Hite Model 526 with LAN, you must decide if the connection is made through a network or direct. A CAT5e Straight Through Cable must be used for a network connection and a CAT5e Crossover Cable if connecting directly to the Model 526.

6.2.6.1 How to Set-Up and Run Windows® HyperTerminal

Windows® HyperTerminal can be used to program the Krohn-Hite Model 526 using the LAN connection.

Once you have made the LAN connection via a network or directly to the 526, do the following:

Click START, then ALL PROGRAMS, then ACCESSORIES, then COMMUNICATIONS and finally HYPER TERMINAL. This will execute the Hyper Terminal Program.

Enter a name in the **Name** box (example: 526), then click on "OK".



Figure 6.9 - HyperTerminal New Connection

Now in the **Connect Using** box, change the COM1 to TCP/IP.



Figure 6.10 - Hyper Terminal Comm Entry


Connect To
526
Enter details for the host that you want to call:
Host address:
192.168.1.113
Port number:
10027
Connect using:
TCP/IP (Winsock)
OK
Cancel

NOTES

SECTION 7

Incoming Acceptance

7.1 Introduction

This section contains operational and verification tests which provide a method of testing the operation and accuracy of the Model 526.

7.2 Warm-Up Time

To maximize performance in the Model 526, the unit should be running for 2 hours.

The top cover of the 526 should not be directly exposed to airflow from a heat or air conditioning register, or air circulating fan. For peak performance when the 526 is moved to a new location, allow the 526 to acclimate to its environment for 1 to 2 hours. If the 526 has been off for an extended period of time allow 2 hours for the internal temperatures to stabilize and achieve maximum performance. When first making connection to the 526 and other devices, allow temperatures generated thermals at the terminals to stabilize for a minute or two. This is important for µV level effects.

Following these recommendations will maximize the 526 capabilities and are good practices for any ultra-precision instrument.

7.3 Required Test Equipment

The following equipment is needed to perform the incoming acceptance of the Model 526.

1. Digital Mulitmeter: HP3458A or Fluke 8508A or equivalent.

2. 100 ohm Precision Resistor: ±1ppm accuracy, ±6ppm 12 month stability, Krohn-Hite Model PCR100 or equivalent.

7.4 Preliminary Set-Up

1. Verify that the Model 526 and the Multimeter have properly warmed-up.

The Multimeter requires a 4-hour warm-up period. If this has not occurred, turn the unit on and allow the proper time to warm-up.

2. If the Multimeter self-test has not been run, disconnect all input connections and press the [TEST] key. When completed, the display should indicate “SELF TEST PASSED”.

7.5 Verification Procedure

7.5.1 Output Voltage Checks

1. Connect the 526 Output to the HP/Agilent 3458A Multimeter using low thermal cables (Krohn-Hite CAB023 low thermal banana cables or CAB024 low thermal spade lug cables recommended).

2. Configure the 3458A Multimeter for highly accurate measurements by pressing [RESET], powered-on state; [NPLC 200], integration time of 200 power line cycles; [NDIG8], 8.5 digits.

   Note: *The longer integration time reduces measurement noise and increases resolution.*

3. Set the 526 to the following ranges/voltages from Table 4.1 below. Readings should be within the Meter Readings Limits.

Range	Decade Setting	Meter Reading Limits (Volts)		
100mV	00.0000	-0.0000030	-	0.0000030
	10.0000	0.0099970	-	0.0100032
	50.0000	0.0499960	-	0.0500040
	100.0000	0.0999950	-	0.1000050
1V	.000000	-0.000005	-	0.000005
	.100000	0.099993	-	0.100007
	.500000	0.499985	-	0.500015
	1.000000	0.999975	-	1.000025
			-	
10V	0.00000	-0.000052	-	0.000052
	1.00000	0.999928	-	1.000072
	5.00000	4.999848	-	5.000152
	10.00000	9.999748	-	10.000252
			-	
100V	00.0000	-0.000500	-	0.000500
	10.0000	9.999300	-	10.000700
	50.0000	49.998500	-	50.001500
	100.0000	99.997500	-	100.002500

Table 4.1 - Voltage Limits Check

Repeat the above checks with the POLARITY setting to minus (-).

7.5.2 Output Current Checks (using PCR100 Precision Resistor)

Proper connections that need to be made between the Multimeter, Model 526 and the Precision 100 Resistor in order to limit thermal errors. Cable sets CAB023 or CAB024 are recommended.

1. Connect the 526 Output terminals, using low thermal cables, to the 100 ohm current resistor.

2. Connect the 100 ohm terminals, using low thermal cables, to the input of the Multimeter.

3. Set the 526 to the following ranges/currents from Table 4.2 below. Readings should be within the Meter Readings Limits.

Range	Decade Setting	Meter Reading Limits (Volts Across 100 Ohms)		
10mA	0.00000	-0.000005	-	0.000005
	1.0000	0.099990	-	0.100010
	5.0000	0.499970	-	0.500030
	10.0000	0.999945	-	1.000055
100mA	00.0000	-0.00002	-	0.00002
	10.0000	0.999930	-	10.00070
	50.0000	4.999730	-	5.000270
	100.0000	9.999480	-	10.000520

Table 4.2 - Current Limit Checks

Repeat the above checks with the POLARITY setting to minus (-).

NOTES

Krohn-Hite Corporation
15 Jonathan Drive, Unit 4
Brockton, MA 02301-5566
Tel: (508) 580-1660; Fax: (508) 583-8989
Email: sales@krohn-hite.com

Copyright 2021 Krohn-Hite Corporation U.S.A.
Published 111721
Revision: 3.6



KROHN-HITE CORPORATION