Model 3916C

IEEE-488 Programmable Filter Mainframe

Operating and Maintenance Manual

MAINFRAME
Serial No. _____

MICROPROCESSOR
Serial No. _____

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Model 3916C IEEE-488 Programmable Filter Mainframe

SECTION 1
GENERAL DESCRIPTION

1.1 INTRODUCTION

The Model 3916C Mainframe is used in conjunction with the Krohn-Hite plug-in modules, that are operational only when inserted in the sixteen module Model 3916C Mainframe. The Mainframe includes a Model 39A-16 microprocessor plug-in module. The modules are easily accessible from the rear of the Mainframe.

The Mainframe provides local/IEEE-488 programming, indicators for the input and output gain, cutoff frequency setting, channel selection and overload detection. Non-volatile, battery-backed, CMOS memory permits storing and recalling of 25 selectable groups. Storing and recalling group settings is accomplished with only one command. Self-testing of the digital circuitry occurs upon power-up.

This Operating and Maintenance Manual is for the Model 3916C and its Model 39A-16 microprocessor model only. Separate manuals are provided for each type of module.

1.2 SPECIFICATIONS

CAPACITY: 16 modules.

1.2.1 MEMORY: 25 selectable groups; each group has storage for 16 module set-ups. Memory is non-volatile battery-backed CMOS.

1.2.2 OVERLOAD MODES: Three selectable modes; non-latching, that monitors all channels and displays first channel to overload; latching that maintains overload display until cleared and no indication (used with some models).

1.2.3 OVERLOAD INDICATORS: LED's for input and output. Gain display flashes when overload occurs on displayed channel (used with some models).

1.2.4 SELF-TEST DIAGNOSTICS: MPU checks unit upon power-up. Display indicates failure modes.

1.2.5 DISPLAYS: 7 segment green LED; 0.5" high.

1.2.6 REMOTE PROGRAMMING: IEEE-488/1978 GPIB interface. Subset: SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT0, C0, E1.

1.2.7 OPERATING TEMPERATURE: 0° to 40°C (Specifications apply at 23°C ±5°C).

1.2.8 STORAGE TEMPERTURE: -20° to +70°C.

1.2.9 POWER REQUIREMENTS: 90-132/180-264 volts ac, 50-60Hz, 25 watts.

1.2.10 DIMENSIONS: 8 ¾" (22.1 cm) high, 17" (43.2 cm) wide, 19 ½" (49.6 cm) deep.

1.2.11 WEIGHTS: 31 lbs. (14 kg) plus 1.75 lbs. (0.8kg)/channel.

1.2.12 ACCESSORIES: Operating and maintenance manual; 6 foot, 3 terminal line cord.

1.2.13 OPTIONS: Rack Mount; RK-817; Module Extender; 39AME.

1.2.14 CONNECTORS: Input/Output BNC on front and rear panels.

Specifications subject to change without notice.

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SECTION 2
OPERATION

2.1 INTRODUCTION

This section describes the basic operation of the programmable multi-channel filter system consisting of the Model 3916C Mainframe, its microprocessor plug-in module and filter plug-in module(s). It includes the proper ac requirements, the recommended turn-on procedure, and a detailed explanation of all operating controls, modes of operation and special features. Implementation of the IEEE-488 standard interface bus for remote programming is explained in Section 3 of this manual.

This Operating and Maintenance manual is for the Model 3916C Mainframe and its microprocessor only. Separate manuals are provided for each type of filter module.

2.2 TURN-ON PROCEDURE

The Model 3916C line voltage range has been preset for either 115V o4 230V operation. Check fuse in fuse receptacle for correct rating.

2.2.1 Make certain the POWER switch on the front panel is off.

2.2.2 Plug the line cord into the Mainframe, then the ac outlet.

2.2.3 If the Model 3916C is to be programmed remotely, connect the bus cable to the rear panel connector of the Model 39A-16 microprocessor.

2.2.4 After reading the Self-Test feature, described next, turn on the Model 3916C.

CAUTION
For safety purposes, the line cord must be connected to a grounded 3 terminal ac outlet. Because of the potentially dangerous voltages within the unit, the covers should be removed by qualified personnel only when connected to an ac power source.

2.3 SELFT-TEST

When the unit is turned on, the microprocessor performs a Self-Test routine whereby the entire RAM and ROM operation is verified. During the test, the front panel LED's and DISPLAYS will light sequentially. If there is a malfunction in the microprocessor, such as defective RMA or ROM, the sequence will stop and the word "bad" will appear in the DISPLAY followed by the number 1 to 3. Refer to Section 6, Maintenance, to find which ROM or RAM is defective.

When the Self-Test program is complete, the Model 3916C will return to the last set-up prior to turning the unit off. The Model 3916C is now ready to be programmed for operation.

2.4 FRONT PANEL CONTROLS AND DISPLAYS

Figure 2.1 shows all the front panel controls and displays of the Model 3916C.

Figure 2.1 Model 3916C Front Panel Controls

2.4.1 DATA KEYS AND DISPLAY

Data entry keyboard controls [0] to [9] and [.] set the numeric value of the parameter selected. To enter 1.5kHz press the [1][.][5] keys and parameter keys [KILO] and [FREQ]. The cutoff frequency will be indicated in the four digit DISPLAY.

2.4.2 CONTROL KEYS

2.4.2.1 [KILO] Multiplies the numerical value of the keyboard entry by 10^3.

2.4.2.2 [MEGA] Multiplies the numerical value of the keyboard entry by 10^6.

2.4.2.3 [FREQ] Enters and/or displays frequency in Hertz.

2.4.2.4 [TYPE] Indicates the filter type in the channel displayed. “EL7” (7-pole Elliptical), “EL5” (5-pole Elliptical), “bu.” (Butterworth) and “bES” (Bessel).

2.4.2.5 [MODE] Indicates the mode of operation in filter channel displayed, “bYP.” for bypass, “L.P.” for low-pass, “h.P.” for high-pass, “b.P.” for band-pass, and “b.r.” for band-reject.

2.4.2.6 [RECALL] When preceded by a number it will recall the entire five module set-ups from the memory location selected.

When first pressed, the DISPLAY indicates the number of the next memory location to be recalled. For example, the DISPLAY will indicate the following: “n=09”. Pressing it again will recall the set-up of all five modules from that memory location.

When pressed to indicate the next memory location to be recalled only, pressing the clear entry key [CE] will restore the DISPLAY back to the previous setting.

2.4.2.7 [ALL CHANNEL] When frequency, input/output gain, type, mode or coupling are entered or changed, and the LED in the [ALL CHAN] key is on, the new setting will also be entered in all other filters of the same module type.

2.4.2.8 [SECOND FUNCTION] The [SECOND FUNCTION] key in conjunction with other keys provides additional filter characteristics and permits GPIB front panel data entry.

2.4.2.8.A Store - When the [SECOND FUNCTION] key followed by the [RECALL] key is pressed, the STORE FUNCTION is performed.

When [SECOND FUNCTION][RECALL] is pressed, the DISPLAY indicates the number of the next memory location available. For example, the DISPLAY will indicate the following: “n=09”. Pressing [SECOND FUNCTION][RECALL] again will store the set-up of all modules into that memory location. If another memory location is desired enter that location on the keyboard and then press [SECOND FUNCTION][RECALL].

When [SECOND FUNCTION][RECALL] is pressed to indicate the next memory location only, pressing the clear entry key [CE] will restore the DISPLAY to the previous indication.

2.4.2.8.B AC/DC Coupling - Pressing the [SECOND FUNCTION] key followed by the [MEGA] key will display the input coupling, indicating “AC” or “DC”, and will alternate when the two keys are pressed gain.

2.4.2.8.C Input Ohms - When [SECOND FUNCTION] key followed by input GAIN SET [⇑[key are pressed, the DISPLAY will indicate the current input ohms and will step through the ohms available each time the two keys are pressed again.

2.4.2.8.D GPIB Address - When the [SECOND FUNCTION] key followed by the [TYPE] key are pressed the DISPLAY will indicate the existing GPIB address setting. To select a different one, enter it into the data keys from (0) to (30) and press the [SECOND FUNCTION] and [TYPE] keys (See Section 3.2.1).

2.4.2.8.E GPIB Line Termination - When the [SECOND FUNCTION] key followed by the [ALL CHAN] key are pressed the DISPLAY will indicate the existing GPIB LINE TERMINATION CODE SEQUENCE. To select a different one, enter it in the data keys from (0) to (30) and press the [SECOND FUNCTION] and [ALL CHAN] keys. (See Section 3.2.1).

2.4.2.8.F Software Version - When the [SECOND FUNCTION] key followed by the [KILO] key are pressed the DISPLAY will indicate the software version.

2.4.2.8.G Overload Mode - Some of the Krohn-Hite plug-in filter modules have three different overload modes. When the [SECOND FUNCTION] key followed by the [MODE] key are pressed the DISPLAY will indicate the current overload mode. When a data key from (1) to (3) is pressed, followed by the [SECOND FUNCTION] and [MODE] keys the overload mode desired can be selected.

2.4.2.8.G.1 MODE 1 (DISPLAY indicates "-1—")
In mode 1 the input and output front panel overload LED's will be off when either the input or output amplifier in any filter module is overloaded.

2.4.2.8.G.2 MODE 2 (DISPLAY will indicate "-2—")
In mode 2 the input and/or output front panel OVERLOAD LED(s) will turn on when the input and/or output amplifier(s) of any filter is overloaded. To determine which filter is overloaded it is necessary to scan all the filters. An intermittent GAIN DISPLAY will indicate an overload condition in the input and/or out amplifier(s) of that filter. This overload condition in any filter can be eliminated by either reducing the gain of the appropriate amplifier or reducing the input signal amplitude to that filter.

2.4.2.8.G.3 MODE 3 (DISPLAY will indicate"-3—")
In mode 3 the overload indicators are in a latched mode. The GAIN DISPLAY(s) remain intermittent and LED(s) stay on even after the overload is removed. Pressing the front panel clear entry key (CE) will normalize the DISPLAY(s) and turn off the LED(s).

2.4.3 INPUT GAIN KEYS AND DISPLAY

Up and down GAIN SET controls [⇑] and [⇓] increase or decrease gain indicated on two digit DISPLAY. Range and resolution dependent on filter module.

2.4.4 OUTPUT GAIN KEYS AND DISPLAY

Up and down GAIN SET controls [⇑] and [⇓] increase or decrease gain indicated on two digit DISPLAY. Range and resolution dependent on filter module.

2.4.5 CHANNEL KEYS AND DISPLAY

Up and down CHANNEL controls [⇑] and [⇓] increase or decrease the channel setting shown on the DISPLAY. When held, the DISPLAY will cycle through all channels continuously.

2.4.6 CLEAR ENTRY KEY (CE)

When entering a numeric value in the keyboard, but not specifying a parameter, pressing the clear key [CE] will function as an error correction procedure and restore DISPLAY to its previous set-up.

When a numeric value and its parameter has been entered and the numeric value is then changed, pressing the [CE] key will restore DISPLAY to the previous value of that parameter.

When either the [SECOND FUNCTION][RECALL] or [RECALL] key is pressed, the next memory location will be indicated on the DISPLAY. Pressing the [CE] key will restore DISPLAY to its previous setting.

When the DISPLAY contains information other than the frequency, pressing the [CE] key will restore the DISPLAY to the current frequency.

Repeated pressing of [CE] key will toggle between the current setting and the immediate previous setting of the input gain, output gain, frequency, mode, type, coupling and input ohms setting.

If the Model 3916C is operating via the IEEE-488 GPIB bus (front panel REMOTED LED should be on), pressing the [CE] key will return the unit to LOCAL operation.

2.4.7 LED INDICATORS

When on, INPUT OVERLOAD LED indicates input amplitude is greater than specified voltage. When on, OUTPUT OVERLOAD LED indicates output amplitude is greater than specified voltage. When on, REMOTE LED indicates Model 3916C is in remote programming mode.

2.4.8 CONNECTORS (BNC)

The Model 3916C has two front panel input and output BNC Connectors for each channel to accommodate dual filter modules. For modules containing one filter per module, one of the input and output connectors is inoperative.

2.4.9 SWITCH

On-off toggle switch for main ac power.

2.5 REAR PANEL

2.5.1 INTRODUCTION

Figure 2.2 shows a simplified layout of the Model 3916C rear panel. It consists of a microprocessor module (lower left) and sixteen module slots to accommodate plug-in filter modules.

2.5.2 CONNECTORS (BNC)

Each module has two input and two output connectors for a dual filter module and one input and one output connector for a single filter module.

2.5.3 POWER

Receptacle: Standard 3 pin.
Fuse: 3A slow-blow for 120V; 1.5A slow-blow for 240V.

2.5.4 CONNECTOR (REMOTE)

Standard IEEE-488 interface. Subsets are SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT0, C0 and E1.

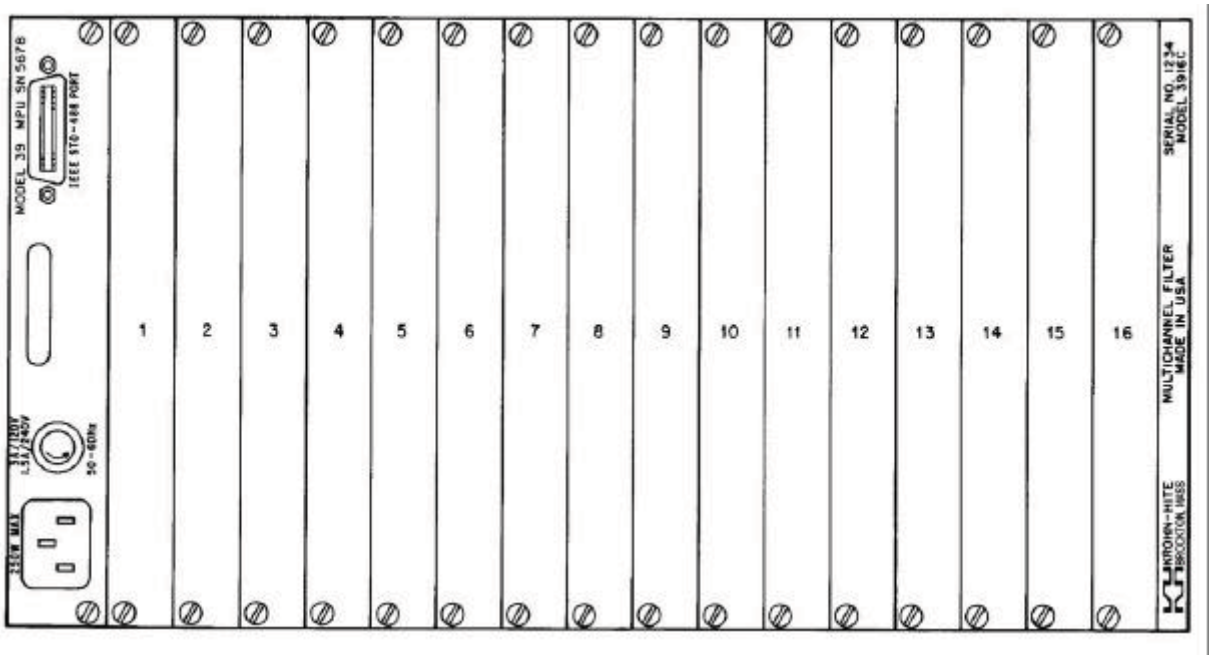

Figure 2.2 Rear Panel of Model 3916C

SECTION 3
IEEE-488 STD (GPIB) PROGRAMMING

3.1 INTRODUCTION

The Model 3916C remote programming interface accepts both ASCII data commands and IEEE-488 standard commands (ATN true) for control of the unit.

In presenting the information required to program the Model 3916C via the IEEE-488 STD bus, this manual presupposes a user knowledge of both ASCII data and IEEE-488 bus commands.

3.2 PRELIMINARY PROGRAMMING INFORMATION

3.2.1 GPIB PRIMARY BUS ADDRESS

The GPIB primary address and software-line-termination-character-sequence (LTCS) selection is set via the front panel keyboard as listed in tables 3.1 and 3.2. These two parameters are stored in non-volatile memory and will be remembered indefinitely, even when the power to the unit is removed. They do not need to be reentered each time the unit is turned on.

The LTCS affects the GPIB in the TALKER mode only (data output from the 3916C to the GPIB). After the printable characters have been sent, non-printable characters, such as carriage return (CR) and line feed (LF), are often required to achieve the desired results in various computers. Table 3.2 lists the various key sequences with the LTCS it selects.

SETTING AND DISPLAYING THE GPIB PRIMARY ADDRESS

Function	Keyboard Entry
a. To set a primary address from 0 to 30	[x] [SECOND FUNCTION] [TYPE]
b. To display the primary address	[SECOND FUNCTION] [TYPE]

Table 3.1

LINE-TERMINATION-CHARACTER-SEQUENCE

Line-Termination-Character-Sequence	Keyboard Entry
a. None (EOI only)	[0] [SECOND FUNCTION] [ALL CHAN]
b. Carriage return (with EOI)	[1] [SECOND FUNCTION] [ALL CHAN]
c. Line Feed (with EOI)	[2] [SECOND FUNCTION] [ALL CHAN]
d. Carriage return followed by line feed (with EOI)	[3] [SECOND FUNCTION] [ALL CHAN]
e. Line feed followed by carriage return (with EOI)	[4] [SECOND FUNCTION] [ALL CHAN]
f. Display present LTCS	[SECOND FUNCTION] [ALL CHAN]

Table 3.2

3.2.2 IEEE-488 BUS INTERFACE PROGRAMMING CONNECTOR

The rear panel programming connector, labeled “IEEE-488 PORT” (Figure 3.1), is the standard bus interface connector as specified in the IEEE-488 STD.

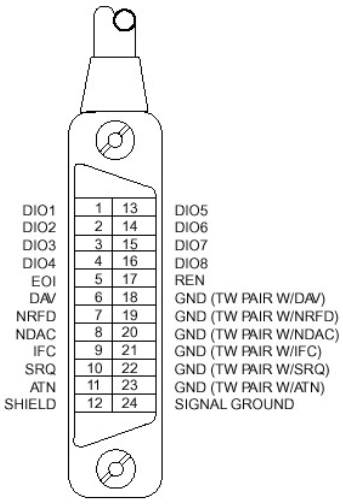

Figure 3.1 Rear Panel GPIB Connector

3.3 ASCII DATA COMMANDS

3.3.1 FORMAT

The 3916C employs free-format software commands, allowing the user to program a specific function in several different ways. See Section 3.3.3.

3.3.2 TYPES OF DATA COMMANDS

3.3.2.1 Commands fall into two types: Those involving numeric parameters and those that do not.

Commands which involve numeric data contain (3) types of fields:

3.3.2.1.A Numeric: Numeric fields may be floating point or scientific notation.

1	=	1.0
1.0	=	1.0
2.7E3	=	2.7×10^{3}
-2E3	=	-2×10^{3}
2E-3	=	2×10^{-3}

3.3.2.1.B Multiplier: “KILO”.

3.3.2.1.C Parameter: Parameter (frequency, gain, channel, etc.) is included in Section 3.3.3.

3.3.2.2 Delimiters which may separate commands are the following: (; : / \ .)

3.3.2.3 Two consecutive character strings (i.e. parameter and multiplier) must have a space between them or they will be treated as one string.

3.3.2.4 The 3916C uses an internal 32 character buffer for command processing. A line may be composed of multiple commands, separated by delimiters mentioned above. No commands are executed until the line is terminated with a line feed ASCII character (Hex 0A) or carriage return (Hex 0D) or by sending the end-or-identify (EOI) command with the last character.

3.3.3 TABLE OF ASCII COMMANDS

In this Section there are characters that are underlined and characters that are **not** underlined. The characters that are underlined **must** be sent for the command to be recognized properly. Any additional characters may be sent once all the underlined letters are sent. Commands are case sensitive; upper case characters **must** be used.

MODEL 3916C GPIB COMMANDS

Command Desired	**Allowable Character String**	
Input Gain	IG	set input gain
	IU	increase input gain (up)
	ID	decrease input gain (down)
Frequency	F	frequency
	H	frequency (Hz)
	K	kilo (10^3 multiplier)
Channel	CH	set Channel
	CU	next channel (up)
	CD	previous channel (down)
Output Gain	OG	set output gain
	OU	increase output gain (up)
	OD	decrease output gain (down)
Type	TY	See GPIB section of filter manual
Termination	TE	input terminate (50 ohms Ch. 2.1 only)
	U	input unterminate (1M ohm Ch. 2.1 only)
Mode	MO	See GPIB section of filter manual
	ME	Mega (10^6 multiplier)
Coupling	AC	ac coupled
	D	dc coupled
Store	ST	store
Recall	R	Recall
All Channel	AL	all channel mode
	B	NOT all channel mode
Miscellaneous	CE	clear entry
	OV	overload (1, 2, 3)
	OS	send overload status (see Section3.5.2)
	Q	reports board model number(s) (see Section 3.5.4
	SRQON	GPIB service request on
	SRQOF	GPIB service request off
	V	report model number and software version

Available selections are dependent upon the type of module installed in a given channel (especially type and mode)

Alphabetical Listing of Model 3916C GPIB Commands

Character String	Command
AC	ac coupled
AL	all channel mode
B	NOT all channel mode
CD	channel down
CE	clear entry
CH	channel # n
CU	channel up
D	dc coupled
F	frequency
H	frequency (Hz)
ID	input gain down
IG	input gain
IU	input gain up
K	kilo
MO	mode
ME	Mega (10^6 multiplier)
OD	output gain down
OG	output gain
OU	output gain up
OV	overload mode
OS	overload status (see Section 3.5.2)
Q	report board model number(s) (see Section 3.5.4)
R	recall
SRQON	GPIB service request on
SRQOF	GPIB service request off
ST	store
T	type
TE	input terminate (50 ohms Ch. 2.1 only)
U	input unterminate (1M ohm Ch. 2.1 only)
V	report model number and software version (see Section 3.5.3)

3.3.4 EXAMPLES

3.3.4.1 Example 1

To set all channels to 10dB input gain, 2kHz, 0dB output gain: AL; 10IG; 2K; 0OG <LF>.

NOTE: It is only necessary to send those parameters that change, all others remain unaffected.

3.3.4.2 Example 2

To change frequency to 150Hz: 150H
or 150b̶Hz
or 150F
or .15K
or F150
or H150
or HZ150
or K0.15
or 1.5E2HZ
or F1.5E2 or etc.

3.3.4.3 Example 3

To determine the overload status of all the boards (see Section 3.5.2):

Data sent to filter: OS
Data received from filter: 00001000000020003000
Interpretation: channel 1 = no overload
channel 2 = input is overloaded
channel 3 = no overload
channel 4 = output is overloaded
channel 5 = both input and output are overloaded

3.3.4.4 Example 4

To read back the setting of channel 2.2 (see Section 3.5.1):

Data set to filter: CH2.2
Data received from filter : 10b̶2.000E+3b̶02.2b̶00b̶AC
Interpretation: 10dB input gain
2kHz cutoff frequency
channel #2.2
0dB output gain
ac coupled
all channel mode (indicated by the " ")

3.4 IEEE-488 STANDARD COMMANDS

These commands are sent with ATN true as described in the standard.

3.4.1 MULTI-LINE MESSAGES

IEEE-488 Command	Mnemonic	Result
My listen address	MLA	Enables unit to receive data.
Unlisten	UNL	Disables all units from receiving data.
My talk address	MTA	Designates unit to send data.
Untalk	UNT	Disables all units from sending data.

b̶ represents a space.

IEEE-488 Command	Mnemonic	Result
Local lockout	LLO	Disables return-to-local key (CE key) on front panel such that when in remote mode, keyboard cannot be activated by pressing a front panel key.
Go to local	GTL	Puts unit into local control mode such that front panel keyboard is activated.
Device Clear	DCL	Clears current settings for all channels. It does not clear set-ups stored with [STORE] key. It does not change interface bus parameters and flags, such as: addresses, SRQ ON/OFF, parallel poll bit selected, etc. See GPIB Section of filter manual.
Selected Device Clear	SDC	Performs same functions as Device Clear (DCL) except only if unit is addressed.

DISCUSSION: (See Section 2.8 and Figure 10 of the IEEE-488 Interface Standard). Note that there are (4) possible states; local, remote, local-with-lockout, and remote-with-lockout. Front panel, conrol is considered to be local, while control from the system controller is considered to be remote. Selection of local or local-with-lockout and remote or remote-with-lockout is done several ways. When the unit is addressed to talk (MTA) or listen (MLA), it will go into remote. When GO-TO-LOCAL (GTL) is sent, it goes into local mode or local-with-lockout mode.

Also, if lockout mode is not invoked by the controller (local lockout command LLO), pressing the [CE] key when the remote LED is on will return control to the keyboard.

NOTE: *The lockout mode is not related to whether control is local or remote, only whether control can be returned to local by the [CE] key.*

Lockout mode (local-with-lockout and remote-with-lockout versus local and remote) is controlled by the controller. Sending the Local lockout command (LLO) selects the local-with-lockout and remote-with-lockout pair versus remote and local without lockout out. Lockout can only be canceled by the controller placing the remote enable line false.

3.4.2 POLLING COMMANDS

The IEEE standard provides two methods of determining the status of the devices in the system; namely serial poll and parallel poll. The parallel poll produces up to 8 bits of status from up to 8 different units simultaneously. A parallel poll is very fast but provides limited information. The serial poll provides 7 bits of status from one unit at a time.

3.4.2.1 Parallel Polling

The Model 3916C provides for software configuring of which bit and with which polarity the unit should respond. This bit is “true” when an error condition exists. (“ERR” displayed on the panel). Configuring needs to be done only once or anytime the software desires to change the configuration. The commands related to parallel poll are as follows:

For sample sequences, see section 6.5.4 of the IEEE-488 standard.

IEEE-488 Command	Mnemonic	Result
Configure	PPC	Places unit into a state where it expects parallel poll enable and disable commands to establish which bits should be set or selected in response to a parallel poll.
Unconfigure	PPU	Removes unit from PPC state (UNL does the same, but also unlistens device).
Enable	PPE	When unit is in PPC state, it indicates which bit and which polarity the device should respond. Hex codes 60-67 selects bits 0-7 respectively to be set to 0 for a true error response. Since logic 0 is HI on open collector lines, this provides a logical “OR” of all units designated to respond with a given line. Hex codes 68-6F selects bits 0-7 respectively to be set to 1 for a true (error) response. This can provide logical NAND of all units designated to respond with a given line.
Disable	PPD	Clears any configuration previously entered. This is valid only when unit is in PPC state.

Example: If the 3916C to be configured is unit #5, and we want it to respond with a “1” when an error exists:

IEEE-488 Command	Result
MLA5	Addresses unit to be configured.
PPC	Places unit into parallel poll configured mode.
PPE 8	Configures bit #0 (Lo 3 bits of command) to respond with a "“"”(8'' bit) when an error exists.
UNL	Unlistens unit.

For additional sample sequences, see Section 6.5.4 of the Standard.

3.4.2.2 Service Request and Serial Polling

IEEE-488 Command	Mnemonic	Result
Enable	SPE	Unit enters serial poll when a unit is addressed to talk. It will send one status byte in which the hex 40 bit is true if the unit is requesting service.
Disable	SPD	Unit exists serial poll state.

3.4.2.3 Serial Responses

The chart below lists the error numbers, in decimal notation, resulting a command error either from the bus or not from the bus.

The serial responses are:

1. No error: 0.
2. Error (error numbers in decimal notation); see the chart below.

Note: *that if SRQ is "**ON**" and the command which caused the error came from the bus, not the front panel, then the 64 bit will be set in the serial poll response, indicating that this unit requires service.*

Error #	Description
1	Input gain too high or too low.
2	Frequency too high.
3	Frequency too low.
4	Channel # too high.
5	Channel # too low.
6	Output gain too high or too low.
7	Store page # too high.
8	Recall page # too high.
9	Type # invalid.
10	Mode # invalid.

3.4.3 UNILINE MESSAGES

IEEE-488 Command	Mnemonic	Result
End	END	Sent with last byte of data. A line of data may either be terminated by a line feed character or by this command.

IEEE-488 Command	Mnemonic	Result
Identify	IDY	This command, issued by the controller, causes a parallel response which was previously configured by the PPC, PPD, PPE and PPU commands.
Request service	RQS	Generated in response to an error when a command came from the bus, and service request is enabled by the SRQON command.
Remote enable	REN	When true, allows the 3916C to respond to remote messages. When this line goes false, the unit will go to local-with-lockout state, activating the front panel.
Interface clear	IFC	Un-addresses all units and clears all special states.

3.5 TALKER FORMAT

The Talker Software allows an IEEE-488 (GPIB) controller to interrogate the Model 3916C and read back over the bus it's settings (gain, frequency, etc.)

Four different types of data can be sent over the bus: Normally parameter information is returned unless an "OS", "Q", or "V" command is sent to the unit.

3.5.1 PARAMETER INFORMATION FORMAT

1. Two (2) digits of input gain
1a. space
2. Four (4) digits plus decimal of frequency or other alpha
3. If frequency is displayed:
   E+0 if both kilo and mega LEDs is off
   E+3 if kilo LED is on
   E+6 if mega LED is on
3a. space
4. Two (2) digits, a decimal and one digit of channel #
4a. space
5. Two (2) digits of output gain
5a. space
6. "AC" if ac coupled
   "DC" if dc coupled
7. "*" if all channel mode, otherwise a space

(See Section 3.3.4.4 for example)

3.5.2 OVERLOAD STATUS INFORMATION FORMAT

After sending the "OS" command, the next line of data the 3916C send will be four (4) characters per board, each character represents one channel.

The character will be:
"0" if not overloaded
"1" if input is overloaded
"2" if output is overloaded
"3" if both input and output are overloaded.

The first character is board 1 channel 1, followed by board 1 channel 2, 3 and 4; followed then by board 2 channel 1 etc. Channels which are not present return “0”. This data is returned only once per command; after that it returns to talking what the front panel is showing.

3.5.3 MODEL NUMBER AND SOFTWARE VERSION FORMAT

After sending the “V” command, the next line of data read from the 3916C will be as follows:

KROHN-HITE 3916C, V3.0

The version number will reflect the revision level of the firmware in the instrument.

This data is returned only once per command; after that it returns to talking what the front panel display is showing.

3.5.4 BOARD MODEL NUMBER FORMAT

The 3916C can report the type of board in each slot in the chassis in one of three ways:

1. Sending “Q” followed by a number 1-16 (ie. “Q3” for slot 3 will return the model number of the board in the designated slot.
2. Sending “Q0” will return the model number of the board in the slot currently displayed on the front panel.

   The return string for “Qn” or “Q0” is always six characters long; for a model 30-1 it is: “30-1␣␣” (“␣” represents a space). For a model 34 it is: “34␣␣␣␣”; for an empty slot it is: “NONE␣␣”. Querying a channel greater than the capacity of the chassis is permissible and always results in “NONE␣␣”.

3. Sending “Q” alone will report the model number of all the boards in the unit, six characters per board in the same format as above. A unit with a model 30-1 in the first slot, a 34 in the second slot, and all other slots empty will return “30-1␣␣34␣␣␣␣NONE␣␣NONE␣␣NONE␣␣”.

This data is returned only once per command; after that it returns to talking what the front panel display is showing.

SECTION 4
INCOMING ACCEPTANCE

4.1 INTRODUCTION

The Model 3916C Mainframe, in conjunction with Krohn-Hite filter plug-in module(s) and 39A-16 microprocessor plug-in module, are the principal assemblies of an operational multi-channel filter system. The Mainframe essentially houses the filter(s) and microprocessor plug-in module, the power supplies and the front panel controls and indicators. All filter parameters are programmable via the front panel of the Mainframe, or remotely over the IEEE-488 (GPIB) bus.

Incoming acceptance test for the Model 3916C Mainframe requires a microprocessor module and at least one filter module. If an operational filter passes its incoming acceptance test, the Mainframe and associate microprocessor must necessarily be operating satisfactory.

Accordingly, the incoming acceptance test for both the Model 3916C Mainframe and associated Model 39A-16 microprocessor is accomplished by doing the incoming acceptance tests of any filter as described in its Incoming Acceptance section of the Operating and Maintenance Manual.

If a filter module that is known to be operational does not function properly, either the Mainframe or the microprocessor module is defective. If an operational microprocessor is available, the malfunction can be isolated to either the Mainframe of the microprocessor module. Refer to Section 6, Maintenance of this manual.

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