



LOCK-IN AMPLIFIER FREQUENCY EXTENDER

5571

Instruction Manual

DA00010346-001

LOCK-IN AMPLIFIER FREQUENCY EXTENDER

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Instruction Manual

WARRANTY

NF Corporation certifies that this instrument was thoroughly tested and inspected and found to meet its published specifications when it was shipped from our factory.

All **NF** products are warranted against defects in materials and workmanship for a period of one year from the date of shipment. During the warranty period of, **NF** will, at its option, either will repair the defective product without any charge for the parts and labor, or either repair or replace products which prove to be defective. For repair service under warranty, the product must be returned to a service center designed by **NF**. Purchaser shall prepay all shipping cost, duties, and taxes for the product to **NF** from another country, and **NF** shall pay shipping charge to returned the product to purchaser.

This warranty shall not apply to any defect, failure or damage caused by improper use, improper or inadequate maintenance and care or modified by purchaser or personnel other than **NF** representatives.

NF Corporation

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In the unlikely event that a breakdown or unidentified problem has occurred, contact NF Corporation or an NF Corporation sales representative.

When contacting us, please indicate the model name (or product name), manufacturer's serial number, and a detailed description of the problem and the use conditions under which it occurred.

Although we do our best to repair products as promptly as possible, repair of products older than five years may be delayed by difficulties in obtaining replacement parts.

Note that, in cases where replacement parts are no longer being manufactured, repairs may be declined if the product in question has extensive damage or has been substantially modified.

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1. OUTLINE

The 5571 is a frequency converter that is able to extend the lock-in amplifier's upper-limit frequency as high as 5 MHz.

The 5571 simultaneously converts high-frequency (10 kHz to 5 MHz) input signals and reference signals to 2 kHz (1.5 to 2.5 kHz) or 20 kHz (15 to 25 kHz) low-frequency signals which are sent to a lock-in amplifier. Accordingly, when this product is attached, a conventional low-frequency lock-in amplifier can be used as a high-frequency lock-in amplifier for frequencies up to 5 MHz.

Since all of this product's settings can be controlled via GPIB control, auto measurements using a lock-in amplifier are also supported.

2. COMPOSITION



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Accessories	
BNC-BNC cables (1 meter length)	2
Power cord	1
Instruction Manual	1

3. SPECIFICATIONS

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3.1 Signal Input Block

No. of channels: 1

Input type: Single-ended, via BNC connectors

Input impedance: 50 Ω

Power supply connector for FET probe

Maximum input voltage (allowable noise voltage)

When input sensitivity range	= +40 dB:	0.021 V_{0-p}
When input sensitivity range	= +30 dB:	0.07 V_{0-p}
When input sensitivity range	= +20 dB:	0.21 V_{0-p}
When input sensitivity range	= +10 dB:	0.7 V_{0-p}
When input sensitivity range	= 0 dB:	2.1 V_{0-p}
When input sensitivity range	= -10 dB:	7 V_{0-p}

Input sensitivity range (gain between input and output signals)

Switchable among six settings: +40 dB, +30 dB, +20 dB, +10 dB, 0 dB, and -10 dB.

Amplitude frequency characteristics:

10 kHz to 5 MHz ± 1 dB maximum

Input equivalent noise: 10 nV/ $\sqrt{\text{Hz}}$ (Typ.)

3.2 Reference Signal Input Block

No. of channels:	1
Input type:	Single-ended, via BNC connectors
Input impedance:	50 Ω
Maximum input voltage	When input sensitivity range = +40 dB: 0.021 V_{0-p} When input sensitivity range = +30 dB: 0.07 V_{0-p} When input sensitivity range = +20 dB: 0.21 V_{0-p} When input sensitivity range = +10 dB: 0.7 V_{0-p} When input sensitivity range = 0 dB: 2.1 V_{0-p} When input sensitivity range = -10 dB: 7 V_{0-p}
Power supply connector for FET probe	
Input sensitivity range	Switchable among six settings: +40 dB, +30 dB, +20 dB, +10 dB, 0 dB, and -10 dB.

3.3 Frequency Converter Block

The local oscillator oscillates low-frequency output corresponding to the output frequency subtracted from the analytic frequency. The analytic frequency must be set as a frequency when setting it via the panel or the GPIB. For example, when analyzing a 123 kHz signal, set 123 kHz via the front panel. If the output frequency range for this setting is 20 kHz, the local oscillator's oscillation frequency will be 103 kHz. The frequency range that can be analyzed under this frequency setting is from 118 kHz to 128 kHz.

Local oscillator's oscillation frequency ranges:

When output frequency range is 20 kHz:	30 kHz to 4980 kHz
When output frequency range is 2 kHz:	8 kHz to 4998 kHz

Local oscillator's oscillation frequency resolution: 1 Hz

Local oscillator's oscillation frequency accuracy: Within 50 ppm

3.4 Signal Output Block

No. of channels:	1
Output type:	Single-ended, via BNC connectors
Output impedance:	50 Ω
Rated output voltage:	3 Vrms
Maximum output current:	5 mArms
Output frequency ranges:	2 kHz (1.5 kHz to 2.5 kHz) 20 kHz (15 kHz to 25 kHz)
Phase error:	Within $\pm 2^\circ$ (Typ.)

3.5 Reference Signal Output Block

No. of channels:	1
Output type:	Single-ended, via BNC connectors
Output impedance:	50 Ω
Rated output voltage:	3 Vrms
Maximum output voltage:	5 mArms
Output frequency ranges:	2 kHz (1.5 kHz to 2.5 kHz) 20 kHz (15 kHz to 25 kHz)
Output tuning indicator:	Output frequency tuning is indicated by the meter on the front panel

3.6 GPIB's Interface Function

SH1, AH1, T6, L4, SR1, RL2, PP0, DC0, DT0, C0

3.7 General Items

Power supply input:	Switchable among 100, 120, 220, and 240 V AC, with $\pm 10\%$ fluctuation from voltage settings. However, the maximum voltage is 250 V when 240 V is set. Frequency range: 48 to 62 Hz
Power consumption:	Approximately 30 VA
Operating temperature/humidity range:	0 to 40°C, 10 to 90% RH (no condensation)
Storage temperature/humidity range:	-10 to 50°C, 10 to 80% RH (no condensation)
External dimensions (mm):	216 (W) \times 132.5 (H) \times 350 (D)
Weight:	Approximately 6 kg

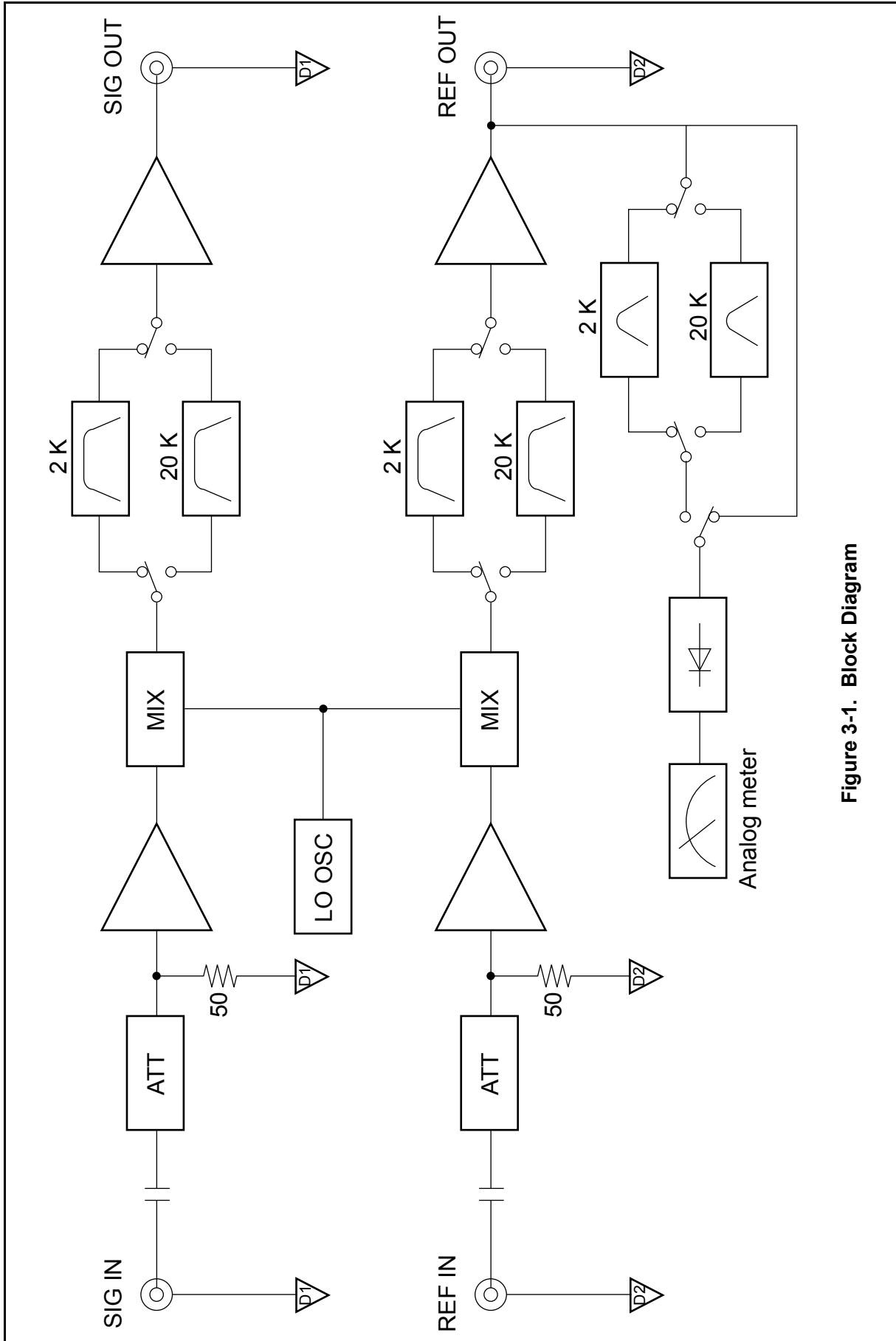


Figure 3-1. Block Diagram

4. PART NAMES AND FUNCTIONS

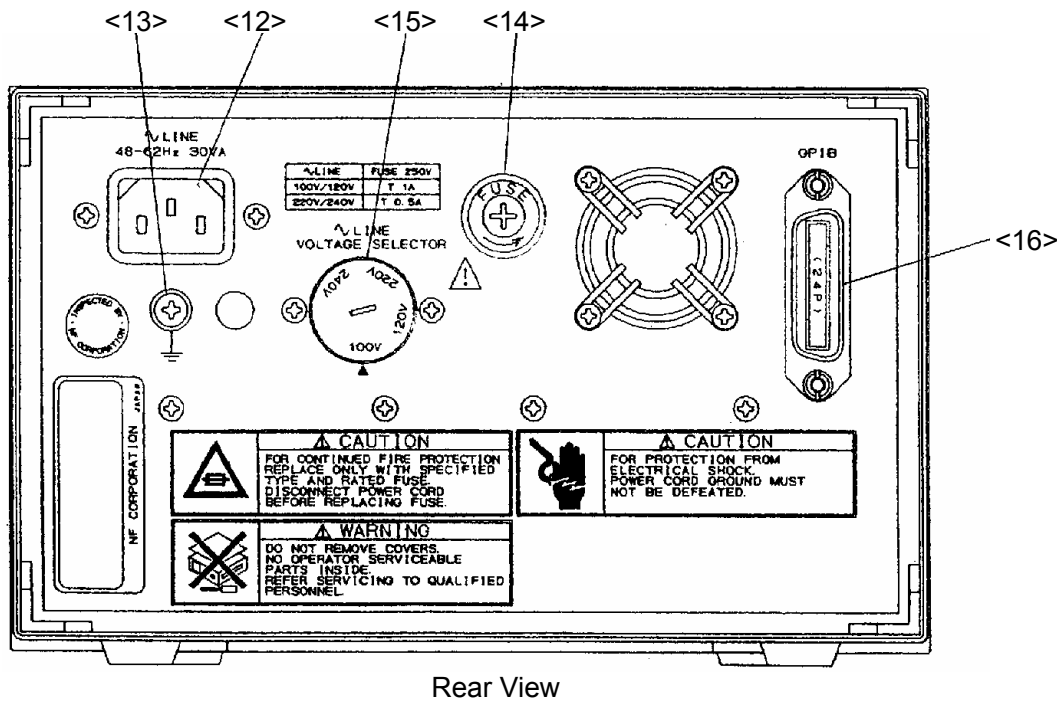
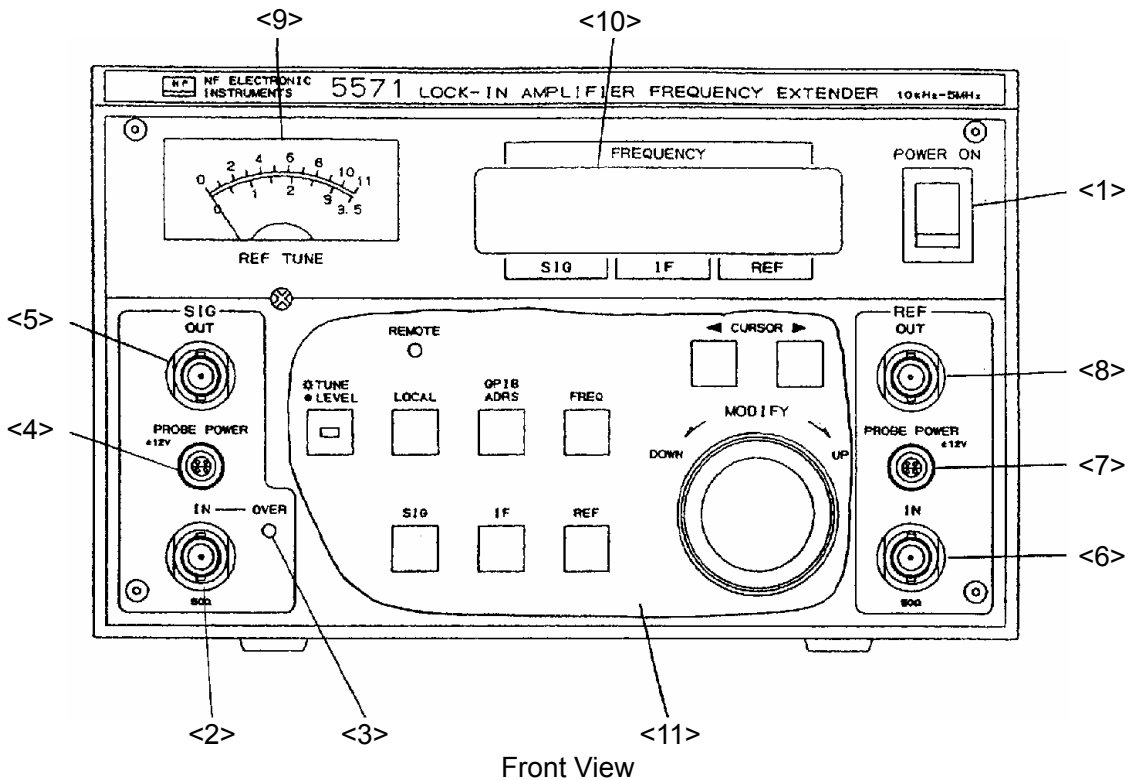


Figure 4-1. Parts Layout

4. PART NAMES AND FUNCTIONS

The functions of the frequency converter components shown in Figure 4-1 are described below in the order they are numbered in the figure.

<1> POWER ON

Use this switch to turn on this unit's power. Set this switch to the upper position to turn on the power. Power consumption is approximately 30 VA.

<2> SIG IN

This is a BNC connector for signal input. Its input impedance is 50 Ω .

<3> OVER

This LED lights up when a signal that exceeds this unit's I/O linear operation range is input to the signal input connector <2>. When this LED is lit, reduce the sensitivity range for signal input until the LED goes OFF, then start taking measurements.

<4> PROBE POWER

When using an FET probe for signal input, ± 12 V voltage is applied to supply power to the probe. We recommend using the AP001 FET probe manufactured by Stack Electronics Co., Ltd.

<5> SIG OUT

This is the BNC output connector for signals that have been input to <2> and frequency-converted. The output impedance is 50 Ω .

<6> REF IN

This is the BNC input connector for reference signals. The input impedance is 50 Ω .

<7> PROBE POWER

When using an FET probe for reference signal input, ± 12 V voltage is applied to supply power to the probe. We recommend using the AP001 FET probe manufactured by Stack Electronics Co., Ltd.

<8> REF OUT

This is the BNC output connector for reference signals that have been input to <6> and frequency-converted. The output impedance is 50 Ω .

<9> REF TUNE

This is an analog meter that indicates the level and tuning of reference signals. When a reference signal is input at the full-scale level for each reference signal range, the meter indicator goes to "10". The meter's level/tuning setting can be changed via a switch on the panel.

<10> LCD display

This display indicates this unit's analytic frequency, signal sensitivity range, output frequency, reference voltage sensitivity range, and GPIB address settings.

<11> Keys and LEDs

Description of keys

• TUNE/LEVEL

Use this key to toggle the display mode of the REF TUNE meter <9> between reference signal level display mode and tuning display mode. The LED on this key lights up when the setting is tuning display mode and is OFF when the setting is level display mode.

• LOCAL

When this key is pressed while this unit is being remotely controlled from an external host computer, it switches control back to this panel. The LED above "REMOTE" lights up when this unit is being remotely controlled and goes OFF when it is controlled via this panel.

• GPIB ADRS

When this key is pressed, this unit is set to GPIB address selection mode, during which "GPIB ADDRESS" appears on the LCD, the cursor blinks, and any value from 0 to 30 can be set via the MODIFY dial.

• FREQ

When this key is pressed, this unit is set to analytic frequency selection mode, during which the cursor on the LCD blinks at the "1" frequency indication. Use the cursor key to change the digit and use the MODIFY dial to increase or decrease the displayed numerical value. The setting range is 10 kHz to 5 MHz, in 1 Hz steps.

The lower-limit frequency setting is 50 kHz when the output frequency is set to 20 kHz.

• SIG

When this key is pressed, this unit is set to signal gain selection mode, during which the cursor on the LCD blinks at the SIG position and a value of -10 dB, 0 dB, +10 dB, +20 dB, +30 dB, or +40 dB (6 steps) can be set via the MODIFY dial.

• IF

When this key is pressed, this unit is set to output frequency selection mode, during which the cursor on the LCD blinks at the IF position and the output frequency setting can be switched between 2 kHz and 20 kHz via the MODIFY dial.

• REF

When this key is pressed, this unit is set to reference signal gain selection mode, during which the cursor on the LCD blinks at the REF position and a value of -10 dB, 0 dB, +10 dB, +20 dB, +30 dB, or +40 dB (6 steps) can be set via the MODIFY dial.

• CURSOR

Use this key to change the digit indicated by the cursor when setting the analytic frequency.

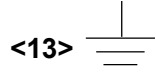
• MODIFY

Use this dial to increment or decrement each setting's parameter value.

4. PART NAMES AND FUNCTIONS

<12> LINE

This is the power supply input connector for this unit's power cord. Make sure the power cord's connector is fully inserted so it will not come loose easily. The power consumption is approximately 30 VA.



This is a GND terminal that is connected to the main unit's chassis. Be sure to connect this terminal to a grounding source to ensure safety and prevent operation faults.

<14> FUSE

This is the fuse holder. The cap on the fuse holder can be removed by turning it counterclockwise with a flat-head screwdriver. Always remove the power cord before replacing the fuse and use only the specified type of fuse.

<15> LINE VOLTAGE SELECTOR

This is the voltage selector for the AC line. First, turn off the power and unplug the power cord, then insert a flat-head screwdriver into the slot in the middle of the selector and turn the selector to the setting for the voltage to be used.

<16> GPIB

This is the connector for the GPIB cable.

5. USE METHODS

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5.2	Tuning of Reference Signal	5-2
5.3	Connection with Lock-in Amplifier	5-2
5.4	GPIB	5-3

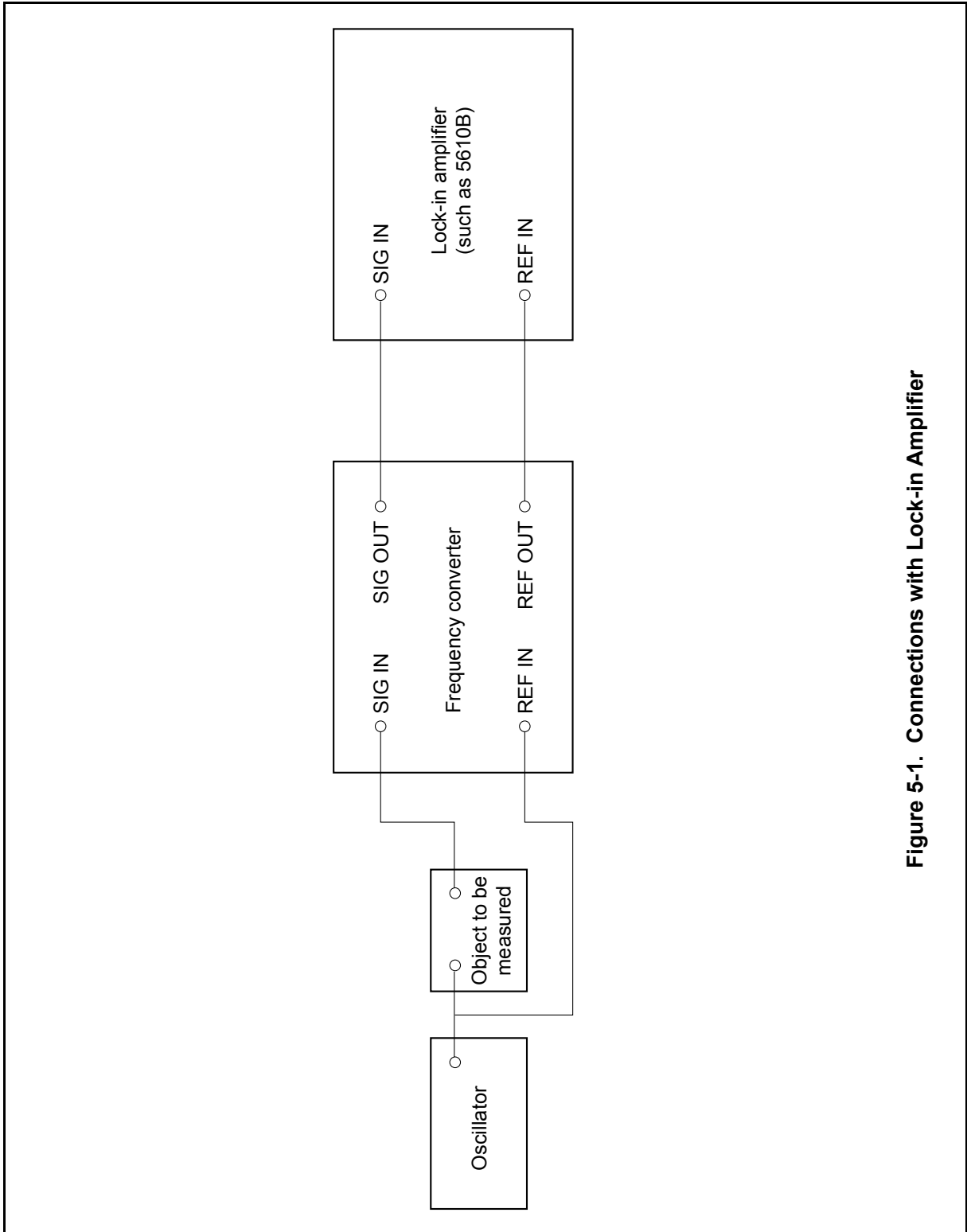


Figure 5-1. Connections with Lock-in Amplifier

5.1 Startup

Once its power is ON, the main unit performs a memory check. If an error is found in memory, one of the following messages appears and the startup procedure is stopped.

Message	Description
ROM ERROR	ROM (Read Only Memory) error
RAM ERROR	RAM (Random Access Memory) error
ROM RAM ERROR	ROM and RAM errors

All of the above messages indicate that the main unit is faulty. Contact NF Corporation for advice.

When operating normally, the main unit uses a battery backup to save previous settings for analytic frequency, signal sensitivity range, reference signal sensitivity range, output frequency, and GPIB addresses.

5.2 Tuning of Reference Signal

First, set the analog meter to level display mode and select the **REF** sensitivity to set the meter's highest amplitude that still keeps the meter's indicator going within the full scale range. Next, switch the analog meter to tuning display mode and use the **FREQ** key to set the analytic frequency as close as possible to the position that was shown during level display mode.

When frequency tuning is optimal, the frequency set via the IF is output from the frequency converter.

Set the output frequency to 20 kHz if the frequency to be measured has a fluctuation range that exceeds 1 kHz. Set it to 2 kHz if this fluctuation range is within 1 kHz.

5.3 Connection with Lock-in Amplifier

Figure 5-1 illustrates the connections with the lock-in amplifier.

For example, if the frequency converter's signal gain is set to +20 dB and the lock-in amplifier setting is 50 μV , the actual signal voltage is 5 μV .

5.4 GPIB

(1) Interface functions

SH1	Source handshake function is included
AH1	Acceptor handshake function is included
T6	Basic talker function is included, without talk-only mode
L4	Basic listener function is included, with listener cancellation by MTA
SR1	Service request function is included
RL2	Local lock-out function is not included
PP0	Parallel polling function is not included
DC0	Device clearing function is not included
DT0	Device clearing function is not included
C0	Control function is not included

(2) Commands

Command Name	Function	Parameters
A	Analytic frequency setting	10,000 to 5,000,000
O	Output frequency setting	1: 2 kHz 2: 20 kHz
S	Signal input sensitivity range	1: -10 dB 2: 0 dB 3: +10 dB 4: +20 dB 5: +30 dB 6: +40 dB
R	Reference signal input sensitivity range	1: -10 dB 2: 0 dB 3: +10 dB 4: +20 dB 5: +30 dB 6: +40 dB

CR, LF, EOI are handled individually or in any combination as delimiters.

(3) Status byte

When the controller detects the 5571's SRQ and begin serially polling, the 5571 transmits a status byte to the controller and sets the SRQ signal line to high level.

The 5571 outputs the following status byte for serial polling.

D7 (MSB)	Not used (always "0")
D6	RQS
D5	Not used (always "0")
D4	Not used (always "0")
D3	Not used (always "0")
D2	Not used (always "0")
D1	Input overflow
D0	GPIB error

After the status byte is output, all of these bits are reset.

WABUN: (DB503814-001)

If there are any misplaced or missing pages, we will replace the manual. Contact the sales representative.

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5571 INSTRUCTION MANUAL

NF Corporation

6-3-20, Tsunashima Higashi, Kohoku-ku, Yokohama

223-8508 JAPAN

Phone +81-45-545-8111 Fax +81-45-545-8191

