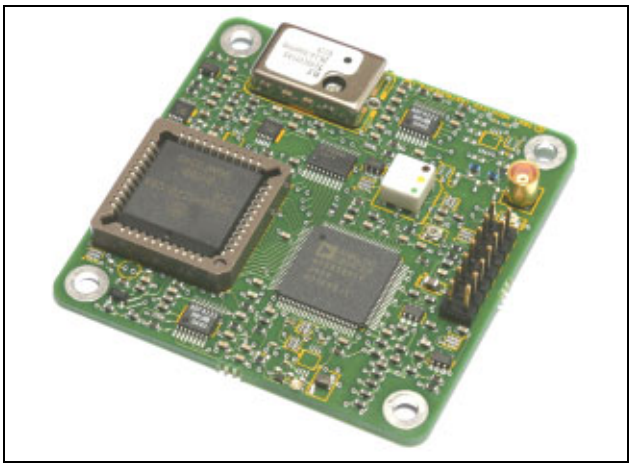
INSTRUMENTS, INC.

400MHz Locking Programmable Oscillator Module

Model LPO400A



The LPO400A is a 400MHz Direct Digital Synthesized Locking Programmable Oscillator on a 60mm square circuit board module. The LPO400A generates a 0dBm sinewave or differential ECL/PECL to 400MHz with exact 1Hz steps under serial control. The serial interface uses simple text commands to control the module and allows non-volatile storage of all settings. The LPO400A is equipped with a ±1.5ppm on-board VCTCXO clock, which can be locked to a programmable external frequency standard, or used independently. Requiring only a single +3.3V power source, the LPO400A is ideal for embedded applications which require programmable frequency sources or for replacing long-lead time custom oscillators. The LPO400A can be used as a high frequency upgrade for the LPO30A. An LPO400A evaluation board contains RS232 drivers, power supply, connectors and software for simplified testing and programming.

Specifications:

OUTPUTS

TYPES: Sine, AC-coupled differential ECL.
IMPEDANCE: 50Ω.
RANGE: 200kHz to 402.65MHz in 1Hz steps.
AMPLITUDE: approximately 0dBm (630mV_{pp} ±30mV_{pp} set at 25MHz) into 50Ω.

ECL

AC-coupled: when terminated meets ECL or PECL 100k level specifications (100EL16). Differential output. (>10MHz)

CONTROL

Output frequency (32-bits) and phase (14-bits) are controlled by a bit-serial asynchronous port (RS232 at TTL/CMOS levels) at 19.2kBaud. Settings can be saved in EEPROM via the serial port. The "STOP" command disables this port and microcomputer for lowest system noise.

ACCURACY AND STABILITY

Accuracy: <±1.5ppm at 10 to 40°C. Stable to an additional ±2ppm per year, 18 to 28°C. (Internal Clock)

REFERENCE CLOCK IN

LEVEL: 0.25-2.0Vrms Sine or Square Wave. 50Ω.
FREQUENCY: 1MHz to 25MHz in 8kHz steps. The on-board voltage-controlled temperature compensated crystal oscillator (VCTCXO) will track the externally supplied reference as long as the external frequency is within ±5ppm (typically ±10ppm) of the nominal value set for the external clock using the "Fr" command. Default reference setting is 10.000MHz. When locked, the output frequency maintains the accuracy and the stability of the reference clock with no binary round-off.

SPECTRAL PURITY (Typ. 50Ω load, 10MHz ref.)

Phase Noise:	<-120dBc, 10kHz offset, 10MHz output.
Spurious:	<-55dBc below 10MHz (typ. 500MHz span)
	<-50dBc below 80MHz
	<-45dBc below 160MHz
	<-35dBc below 400MHz
Harmonic:	<-60dBc below 1MHz
	<-55dBc below 20MHz
	<-50dBc below 80MHz
	<-40dBc below 160MHz
	<-35dBc below 400MHz

SWITCHING TIME

Serial control depends upon host speed and commands sent, typically <10ms for a new frequency setting.

POWER REQUIREMENTS

3.15 to 3.45V@<750mA (+3.3VDC ±5%)

SIZE

60mm by 60mm circuit board. Max. height 15mm.

CONNECTORS

MCX for Sine output, vias on 2mm spacing for differential ECL output. 14-pin header for power, reference clock and interface signals.

ACCESSORY

Model LPO400A-EVAL board contains AC-adapter (+5V DC), RS232 drivers, PC serial cable and SMA connectors for evaluation and programming of the LPO400A module. SOF8 software included with LPO400A-EVAL.

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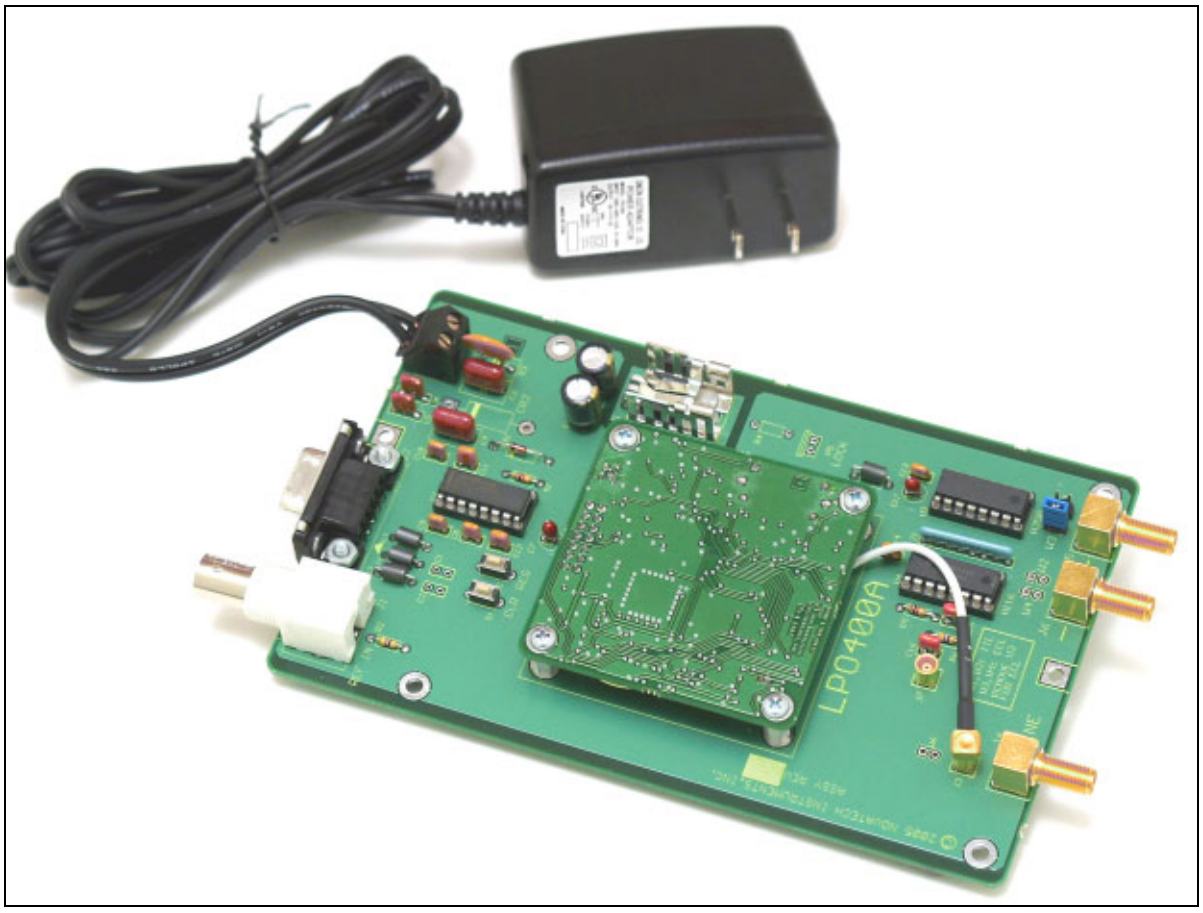
LPO400A Serial Commands

Serial Command	Function
F0 xxx.xxxxxx	Set Frequency in MHz with exact 1Hz resolution. Decimal point required. Maximum 'F0' setting is 402.653183MHz.
Fr xx.xxx	Sets the Reference Frequency in MHz in 8kHz steps. Decimal point required. Range: 1MHz to 25MHz. This value is used to phase lock the internal master clock to the externally supplied clock. Software rounds down to lowest 8kHz multiple.
P0 N	Set Phase. N is an integer from 0 to 16383. Phase is set to N*360/16384 degrees or N*π/8192 radians. Sets the relative phase of the output sine wave. This is useful for adjusting the relative phase of the output after the LPO400A has obtained lock. Factory default is 0.
C x	**E**nable (x=E) or **D**isable (x=D) external lock. When disabled, the internal TCXO is used without locking to an externally supplied clock.
E x	Serial Echo Control. x=D for Echo **D**isable, x=E for Echo **E**nable. Default is **E**nabled.
T x	ECL Output Control. x=D for ECL **D**isable, x=E for ECL **E**nable. Default is **D**isabled.
S	Save current state into EEPROM and sets the EEPROM valid flag. The state saved is used as default upon next power up or reset.
STOP	Turns off the internal microprocessor. The "STOP" command automatically saves all present settings. Use this command in embedded applications for lowest system noise and power. A logic low (open collector) pulse must be applied to the CLR_STOP* connector pin to restore normal operation. After a CLR_STOP* pulse, factory defaults are restored.
R	Reset. This command resets the unit. EEPROM data is preserved and, if valid, it is used upon restart. This is the same as cycling power or toggling the open collector RES* line on the connector.
CLR	Clear. This command clears the EEPROM valid flag and restores all factory default values.
QUE	Read present frequency, phase and status. Returns a character string of internal settings, lock status and software revision number. Hexadecimal format. See manual for details.

Control Connector Pinout

Pin Number	Function	Type	Pin Number	Function	Type
1	Ground (Power Supply Common)	PS	2	NC (open: for LPO30A compatibility)	-
3	TX, serial ASCII data FROM module, TTL level (3.3 V CMOS)	Out	4	Ground (Power Supply Common)	PS
5	NC (open: for LPO30A compatibility)	-	6	RX, serial ASCII data TO module, TTL level (3.3 V CMOS)	In
7	+3.3 VDC ***INPUT***	PS	8	RES*, Open Collector Reset Pin, normally left open.	In
9	Ground (Power Supply Common)	PS	10	CLR_STOP*, Open Collector Input Pin. Pulsing low clears module to factory default outputs and settings.	In
11	INLOCK (TTL level, 3.3 V CMOS),	Out	12	Ground (Power Supply Common)	PS
13	RF_IN, Reference Clock Input, 50Ω.	In	14	Ground (Power Supply Common)	PS



LPO400A Evaluation Kit

(SOF8 software included)