ADS-432-X03
ADS-432-X03A
Operating Instructions

8/4/00
Rev -A

Meret Optical Communications, Inc.

**** WARNING ****

This synthesizer contains devices that are static-sensitive. Extreme caution must be exercised when handling this synthesizer or damage to the Silicon parts will result.

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OPERATING INSTRUCTIONS
ADS-432-X03 Frequency Synthesizer
ADS-432-X03A Frequency Synthesizer

1. PRODUCT DESCRIPTION

The ADS-432-X03 direct digital synthesizer (DDS) uses Silicon technology to operate from 1 to 400 MHz with <0.6 Hz frequency resolution. A proprietary and custom Silicon gate array is used to achieve the combination of wide frequency bandwidth, fine resolution, and fast switching speed that is characteristic of the ADS-431 (external DDS clock) and the ADS-432 series. A Dielectric Resonator Oscillator (DRO) is included in the module to provide the necessary DDS clock (at four times the highest frequency) and the additional circuitry required to phase lock this DRO to an internal or external 10 MHz reference signal is also provided.

Note that the ADS-432-X03A provides quadrature outputs while the ADS-432-X03 provides just a main output.

Frequency Options:

MODEL NUMBER	DDS CLOCK	FREQUENCY RANGE
ADS-432-203	800 MHz*	1 MHz to 200 MHz
ADS-432-303	1,280 MHz*	1 MHz to 320 MHz
ADS-432-403	1,600 MHz	1 MHz to 400 MHz

* to provide frequency resolution and control compatible with the ADS-232 and ADS-332.

2. PERFORMANCE/SPECIFICATIONS

Output Frequency
- Range ..... See above table
- Resolution ..... DDS clock ÷ 2^{31}
- Control ..... 30 parallel BINARY bits (pos-true logic) with STROBE

Main Output
- Level ..... +6 dBm into 50Ω
- Accuracy/Flatness ..... ±2 dB

Quadrature Output ..... same as main output (ADS-432-X03A only)

Spectral Purity
- Harmonics ..... -20 dBc
- Spurious ..... -45 dBc, typical

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2. PERFORMANCE/SPECIFICATIONS (continued)

Phase Noise (ext 10 MHz)..... <-100 dBc/Hz @ 100 Hz offset
<-100 dBc/Hz @ 1 kHz offset
<-115 dBc/Hz @ 10 kHz offset
<-130 dBc/Hz @ 100 kHz offset

Reference Frequency

External..... 10.0 MHz @ 0 dBm ± 2 dB into 50Ω
or
Internal..... 10.0 MHz @ ± 1 ppm accuracy

Auxiliary Output

Frequency..... 10.0 MHz
Level ..... >-15 dBm into 50Ω

Internal Clock Freq. ..... See table above

Frequency Switching

Switching Speed ..... <40 clock cycles plus filter delay (~5 nsec)

Connectors

Main RF Output ..... SMA Female (J11)
Quadrature RF Output ..... SMA Female (J10) — ADS-432-X03A only
Spare ..... SMA Female (J12)
Ext Ref Input..... SMA Female (J8)
Ref. Output ..... SMA Female (J9)
Frequency Control ..... 37-pin male subminiature D-connector (J7)
Power ..... 9-pin subminiature male D-connector (J2)

Environmental

Operating Temp ..... 0°C to +50°C
Storage Temp..... -20°C to +70°C

Power Supply (nominal)..... -5.2V @ 1.3 A; +5V @ 750 mA; +15V @ 200 mA;
Dimensions..... 5"(W) x 7.08"(D) x 1.125"(H);
Weight ..... 2 lbs (0.9 kg), net; 3 lbs (1.4 kg), shipping

3. MECHANICAL CONFIGURATION

The ADS-432 is built according to best commercial practice.

Wherever an external RF signal is either required by the synthesizer or it is provided to the user, an SMA connector is provided. Refer to the section on Signal Connections for a listing of the possible connections.

IMPORTANT NOTE

The board containing the Silicon circuitry consumes approximately 11 watts of power. Heat sinks are employed to aid in heat dissipation but it is important that air be passed over the module in order to further reduce the heat build up.

4. INSTALLATION — Reference Selection

The ADS-432 is configured such that the synthesizer will automatically phase lock the internal DRO to the internal 10 MHz crystal oscillator (±1 ppm) if no signal is presented to the EXT 10 MHz IN port (J8). As long as a signal with a level meeting the input specification of 0 dBm ± 2 dB is connected to the Ext Ref Input SMA, the internal 10 MHz will be disabled and the DRO will be locked to the external reference and provide the same accuracy as the reference.

WARNING

Due to the static sensitivity of some of the synthesizer components, it is important that all the necessary precautions are taken to prevent static damage including but not limited to the use of ground straps and proper grounding techniques. Ground connections must be made first before connecting the frequency control mating connector to discharge any built-up static charge.

5. POWER SUPPLY CONNECTIONS AND REQUIREMENTS

The -5.2V, +5V and +15V DC power is supplied to the 9-pin subminiature D-connector (J2) as follows:

Power Supply	Current (A)	Pin #
-5.2V	1.3 A, (Max)	6
+5V	750 mA ± 20%	2
+15V	200 mA ± 20%	5 & 9
GND	- - -	7 & 8
Not Connected*	- - -	1, 3 & 4

NOTE: If desired, the ADS-432 can derive the +5V supply from the +15V supply internally to permit more complete compatibility with the ADS-232/332 products. This adds 7 Watts to the power consumption!

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6. SIGNAL CONNECTIONS

Several signals are connected to the ADS-432. The signals may be accessed according to the following table:

Output Signal	Female SMA Number
Main Sine Output	J11
Quadrature Sine Output (ADS-432-X03A only)	J10
10 MHz Reference Output	J9

Input Signal	Female SMA Number
10 MHz Reference Input	J8

IMPORTANT NOTE

The 10 MHz output is not buffered so this connection must not be shorted or grounded. Doing so will result in a frequency shift of the output signal since the output will not be locked to the 10 MHz reference.

7. BINARY FREQUENCY CONTROL

A 30 bit, parallel, positive-true TTL logic is standard to the ADS-432. The phase accumulator within the unit allows for synchronizing a data transfer when a synchronizing signal (a strobe pulse) is supplied.

Since the resolution of the synthesizer is "limited" to a non standard step size, some frequency values may not be available. Any frequency, however, will be settable to an accuracy of less than the smallest step size.

Note that the highest programmable frequency is one-quarter (1/4) of the clock frequency. This is accomplished by programming the Most Significant Bit (MSB). If this bit is activated and any other bit is used, no output will result, as this is an illegal frequency setting.

8. SYNCHRONOUS PROGRAMMING

In order to perform a synchronous frequency change (i.e., all digits change simultaneously), the STROBE line must be held at a "LOW" TTL level (0V to 0.4V). Pull any of the 30 frequency control lines to a "HIGH" TTL level (2.4V to 5.5V) in order to produce the desired output frequency (refer to the section containing the listing of the programming control lines).

When the STROBE line is pulled to a "LOW" TTL level, changes in any of the frequency control lines will not result in a change in the output frequency until the STROBE line (pin#17) is pulsed (changed from a LOW to HIGH to LOW TTL level). Data must be valid 2.5 nsec prior to the change in the STROBE line with a minimum pulse width of the STROBE of 10 nsec. The output frequency will be valid 40 clock cycles after the “LOW” to “HIGH” transition.

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9. ASYNCHRONOUS PROGRAMMING

In some cases, it may be desirable to simply change a small number of digits and it is not important whether or not all digits change simultaneously. This may be accomplished very easily by holding the STROBE line (pin #17) to a "HIGH" TTL logic level. When this method is used, any change in the level of any of the frequency control lines will be immediately reflected in a change of the output signal.

NOTE: The data is not stored within the synthesizer when the STROBE line is held "HIGH". If any of the frequency control lines are removed or changed, the output signal will be updated immediately.

10. PHASE RESET

In addition to the frequency control, a separate TTL control line is provided to allow for very fast control of the output signal level. When this "phase reset" line (pin #36) is activated by setting it to a "HIGH" TTL level, the output of the synthesizer will be turned off. When this line is released (TTL "LOW"), the output of the synthesizer will begin at 0° phase when new data is clocked into the synthesizer. Note that it is not necessary to pull this line LOW to activate the output — the default mode of operation for the ADS-432 is with the output turned on.

11. LOCK INDICATOR

Pin #18 on the 37 pin subminiature D-connector will be a TTL "LOW" when the internal phase-lock is locked, and will be TTL "HIGH" when the internal phase-lock is unlocked.

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12. PROGRAMMING CONTROL LINES (J7)

Frequency Weight			Bit#	Pin#
800 MHz clock	1280 MHz clock	1600 MHz clock		
200.0 MHz	320.0 MHz	400.0 MHz	F30	37
100.0 MHz	160.0 MHz	200.0 MHz	F29	35
50.0 MHz	80.0 MHz	100.0 MHz	F28	16
25.0 MHz	40.0 MHz	50.0 MHz	F27	34
12.5 MHz	20.0 MHz	25.0 MHz	F26	15
6.25 MHz	10.0 MHz	12.5 MHz	F25	33
3.125 MHz	5.0 MHz	6.25 MHz	F24	14
1.5625 MHz	2.5 MHz	3.125 MHz	F23	32
781.25 kHz	1.25 MHz	1.5625 MHz	F22	13
390.625 kHz	625.0 kHz	781.25 kHz	F21	31
195.3125 kHz	312.5 kHz	390.625 kHz	F20	12
97.65625 kHz	156.25 kHz	195.3125 kHz	F19	30
48.828125 kHz	78.125 kHz	97.65625 kHz	F18	11
24.4140625 kHz	39.0625 kHz	48.828125 kHz	F17	29
12.207031… kHz	19.53125 kHz	24.4140625 kHz	F16	10
6.10351… kHz	9.765625 kHz	12.207031… kHz	F15	28
3.0517576… kHz	4.8828125 kHz	6.10351… kHz	F14	09
1.5258788… kHz	2.44140625 kHz	3.0517576… kHz	F13	27
762.94… Hz	1.220703125 kHz	1.5258788… kHz	F12	08
381.47… Hz	610.3515625 Hz	762.94… Hz	F11	26
190.73… Hz	305.1757… Hz	381.47… Hz	F10	07
95.37… Hz	152.5878… Hz	190.73… Hz	F09	25
47.68… Hz	76.2939… Hz	95.37… Hz	F08	06
23.84… Hz	38.1469… Hz	47.68… Hz	F07	24
11.92… Hz	19.0734… Hz	23.84… Hz	F06	05
5.96… Hz	9.5367… Hz	11.92… Hz	F05	23
2.98… Hz	4.7683… Hz	5.96… Hz	F04	04
1.49… Hz	2.3841… Hz	2.98… Hz	F03	22
0.745… Hz	1.1920… Hz	1.49… Hz	F02	03
0.372… Hz	0.5960… Hz	0.745… Hz	F01	21
Not Connected			---	2, 20
FREQ. STROBE			---	17
GROUND			---	01,19
RESET			---	36
LOCK			---	18

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13. FREQUENCY PROGRAMMING EXAMPLES

Several examples will be shown to illustrate the logic involved in programming the ADS-432-203 (800 MHz clock):

Desired Frequency	Active ("HIGH") Pins
62.5 MHz	Pins 16 & 15
100.0 MHz	Pins 35 only
78.125 kHz	Pins 11, 29, 9, 27, 7, 25, 5, 23, 3 & 21
77.1604932 MHz	Pins 16, 34, 32, 31, 12, 28, 9, 27, 8, 26, 7, 24, 5, 4 & 21

14.WARRANTY

All Meret products are warranted against defects in material and workmanship for a period of one year after initial shipment. Meret will repair or replace any circuit or component that is found to be defective during this period if in Meret's sole opinion the product is deemed defective.

Any modifications or options performed by Meret during the initial one-year period shall be included under the initial warranty, and such secondary warranties shall terminate one year after the initial shipment. Shipment of the product to Meret (San Diego, CA) shall be made prepaid and shall not be made without prior authorization by Meret.

This warranty is voided if the product is abused or if unauthorized modifications are made by the user.

This warranty is in lieu of all other warranties, expressed or implied, and no person is authorized to represent or assume for Meret any liability in connection with the sales of our products other than stated within this warranty.

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Serial Number

Options: _____

QC by _____ Date: _____

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