

Schematics of Synthesizer-Transmitter Unit, model MK3-PW-PA-TX

The Synthesizer-Transmitter Unit is based on commercial off-the-shelf modules and contains: (i) an ultra-low phase noise reference oscillator (OCXO), (ii) direct digital signal synthesizers and controller (DDS-FPGA), (iii) a power amplifier (PA), (iv) an anti-harmonic filter (LPF), (v) power supplies (PS) and (vi) power line filters (RFI).

A detailed description of the modules is provided in companion technical report “*Generic High Frequency Doppler Radar Synthesizer-Transmitter Unit: Operational Description*”, April 2022 issued by the Radio Oceanography Laboratory of the University of Hawai’i at Mānoa.

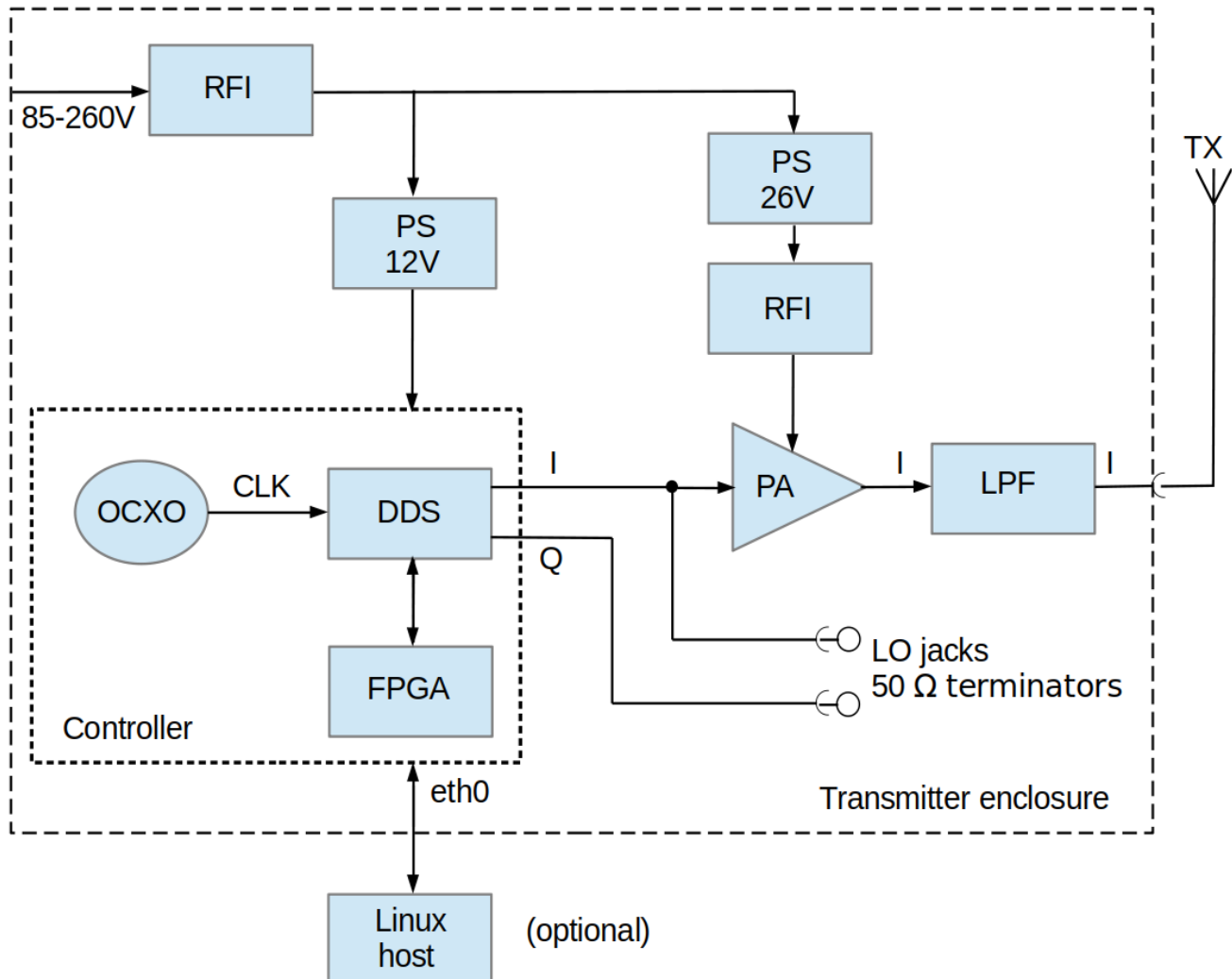


Figure 1. Schematics of the Synthesizer-Transmitter Unit.
See Table 1 for list of components and references.

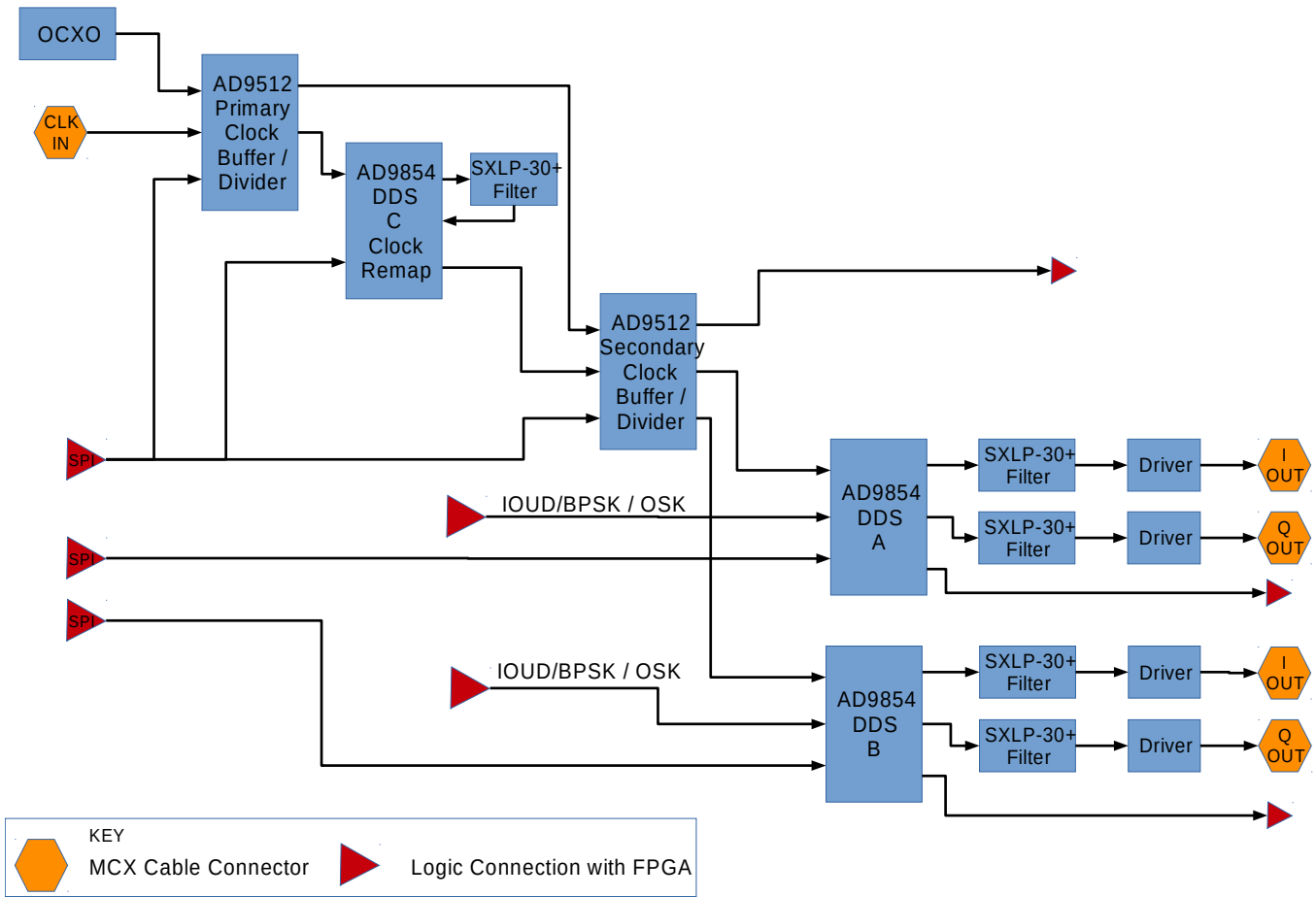


Figure 2. Schematics of the Triple DDS Radar Controller. See Table 2 for list of components and references.

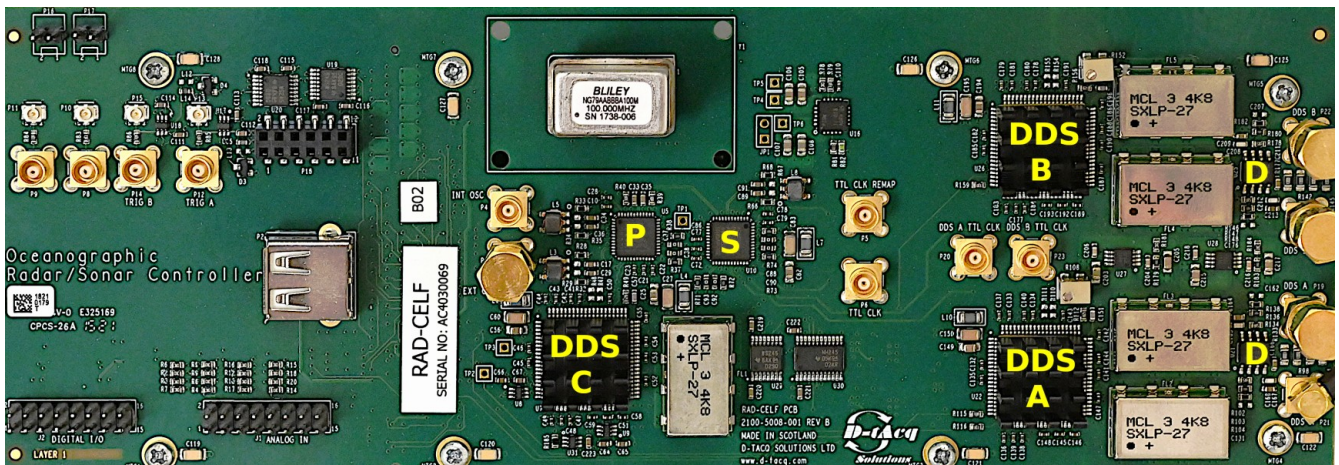


Figure 3. Photo of the Triple DDS Radar Controller board.

Table 1. List of commercial modules incorporated in the Synthesizer-Transmitter Unit

Tag	Description	Reference	Manufacturer
OEXO	Oven-controlled crystal oscillator, 100 MHz	N79A-optA	Bliley Technologies Inc. 2545 W Grandview Blvd, Erie PA 16506 USA
FPGA	Carrier with embedded FPGA&ARM processors	ACQ1001	D-TACQ Solutions Ltd., International House Stanley Blvd, Blantyre G72 0BN Scotland UK
DDS	Triple DDS Radar Controller	RAD-CELF	<i>id.</i>
PA	Radio-frequency power amplifier	BTM00250-AlphaSA	Tomco Technologies 38 Payneham Rd, Stepney, Australia 5069
LPF	Power low-pass filter	FLxxMLP-HFDR	DLW Associates 6 Woodford place, St. Charles MO 63301 USA
PS12V	Industrial power supply	TSP-070-112	Traco Electronic AG Sihlbruggstrasse 111, CH-6340 Baar
PS26V	Industrial power supply	TSP-360-124	<i>id.</i>
RFI-DC	EMI Filter with High Attenuation Performance	FN2030M-Z-20-06	Schaffner Holding AG Nordstrasse 11, CH-4542 Luterbach
RFI-AC	EMI Filter with High Attenuation Performance	FN9266-10-06	<i>id.</i>

Table 2. List of functional integrated circuits used in the Triple DDS Radar Controller

Tag	Description	Reference	Manufacturer
Primary	Clock/buffer divider	AD9512BCPZ	Analog Devices One Analog Way, Wilmington MA 01887 USA
Secondary	Clock/buffer divider	AD9512BCPZ	<i>id.</i>
DDS-A	Direct digital synthesizer	AD9854ASVZ	<i>id.</i>
DDS-B	Direct digital synthesizer	AD9854ASVZ	<i>id.</i>
DDS-C	Direct digital synthesizer	AD9854ASVZ	<i>id.</i>
Filter	Lumped LC low-pass filter	SXLP-27+	Mini-Circuits 13 Neptune Ave, Brooklyn NY 11235 USA
Driver	Operational amplifier	OPA2694D	Texas Instruments 12500 TI Blvd., Dallas TX 75243 USA

Note: other commodity components (inductors, capacitors, resistors, voltage regulators) used on the Triple DDS Radar signal synthesizer board have passive functions and do not contribute to the signal generation.