

# Monopulse Secondary Surveillance Radar with Mode S capability

*Monopulse Secondary Surveillance Radar, developed by ELDIS Pardubice, s.r.o., is a fully modular system, which meets recommendations of ICAO standards.*

## Secondary Surveillance Radar Modular System

Basic configuration of the autonomous secondary radar fully comply with standard MARK X and allows extension according to increasing needs of the customer. Individual modules of the equipment can be used either in new or in older SSR systems. Radar configuration:

- Antenna unit (ASSR)
- Antenna switch
- Interrogator-receiver unit (MSSR-1A, B).
- Extractor A, B
- Display unit (SRDCD).

## Antenna Unit ASSR

The unit is composed from antenna pedestal, drive, antenna frame, and antenna itself. The drive is turning with antenna support frame and antenna. The unit is fitted with two asynchronous motors, gear-box, two- or three-channel rotary joint, and two azimuth encoders.

The following types of antennas are available:

**ASSR-20** - LVA 2-channel SSR antenna (20 column radiators)

**ASSR-35LVA** - LVA 3 - channel SSR antenna (35 column radiators)

The antennas operate at frequencies 1030 MHz (interrogation) and 1090 MHz (reply receiving). The antenna is composed of a set of vertical column radiators that are fed by horizontal feeder created by set of strip power dividers. The differences between individual types insist in gain, number of

channels, and mechanical dimensions.

Each antenna of ASSR series has a main beam (SUM).

The ASSR-20 antenna has DIF and BACK beams that are integrated in a SLS beam.

The ASSR-35LVA antenna has a separate DIF beam and this beam together with SUM beam serve to monopulse measurement of target azimuth. This antenna also has beams OMEGA and BACK. The SLS beam is created by integration of OMEGA and BACK beams at this antenna.

## Interrogator-Receiver Unit MSSR-1

The Interrogator-Receiver Unit is the basic component of a SSR. It contains all circuits necessary to for generate the interrogation, reply receiving and processing in individual interrogation modes.

The concept has been designed to minimize the connection with other subsystems and dependencies on them. This concept enhances system accessibility. The unit includes an extensive internal diagnostics. Owing to full duplicity of critical subsystems and cross-linked configuration the BITE can detect problems with identification of a faulty item up to the level of minimum exchangeable module.

MSSR-1 is a flexible modular system that allows the extension of system configuration for additional functions according to developing requirements for ATC systems (or Air Defence, respectively).



The unit comprises following functional parts:

- Two-channel transmitter
- Three- channel receiver
- Extractor
- Post-processor
- Control and diagnostics.

Transmitter of the MSSR-1 interrogator is designed for generating interrogations, which are transmitted to the space with the help of antenna system, where they are intercepted by aircraft board transponders. The interrogator transmitter is a two-channel transmitter, structure of which is identical for both channels. The transmitter consists of following parts and blocks:

- final stage, driving stage
- local oscillator 1030 MHz
- interrogations modulator
- interrogations generator and synchronizing circuits
- control and diagnostics

The receiver channels are fully identical. Input circuits are protected from penetration of power from the transmitter with high-selectivity filter. Output amplitude / input signal have logarithmic characteristics. Test signals are joined with output amplitude-detected video-signals. Testing is performed in such time period when replies are neither received nor processed.

Extractor receives signals from azimuth information processing system and performs evaluation of received signals, processed by the receiver and from analysis of these signals detects individual reply codes and air targets. It is composed from reply detection and processing unit in individual modes and target correlation unit. The reply detection and processing unit is designed for detection of replies and evaluation of inherent codes. Output messages are recorded into FIFO memory and read-out. Target correlation unit performs final processing of reply codes. Final message of detected target is composed from correlated data.

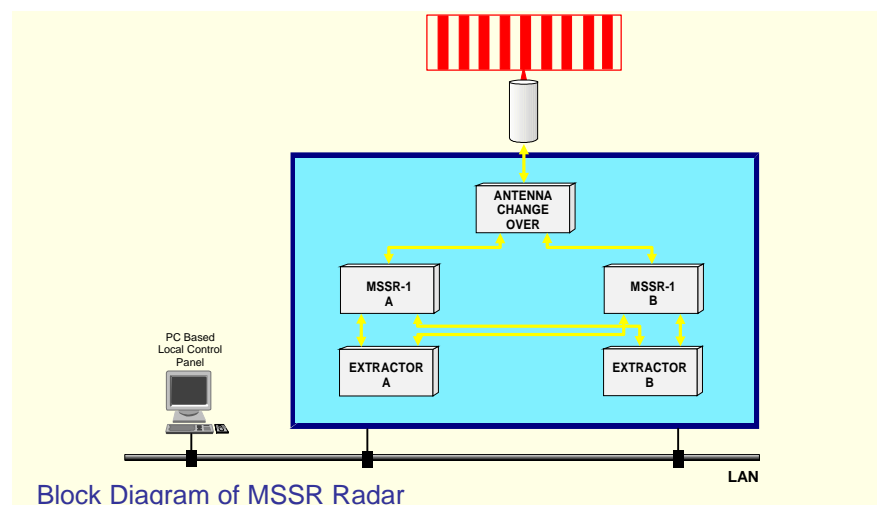
Post processing unit performs correlation between targets in respective modes and integrates them into the most probable target position message, performs analysis based on internal database, cancels replies garbled or damaged by interferences, and transmits additional messages regarding quality of detected information and codes into higher system. The data-base is periodically updated after several antenna scans. The codes are validated by statistical analysis, and damaged replies are filtered if necessary.

Control and diagnostic unit performs several functions. It controls and monitors on-line power characteristics of transmitter / receiver, extractor and communicates with respective subsystems. The test video-signals, which are after processing by receiver analysed in extractor, are generated in this unit. Extractor sends sector messages to the post-processor. The unit communicates with superior system via serial link. This link is also used for transfer of diagnostic data, status reports to superior system, and receiving commands for set-up and control of whole Interrogator-Receiver unit MSSR-1.

Frequency band		1030 & 1090 MHz
Antenna gain	ASSR-20 ASSR-35 LVA	>20 dBi >27 dBi
Mode		1; 2; 3/A; C; Mode S level 2
Input peak power of the transmitter		min. 62 dBm
Supply		3×230/400 V±10 %
Resistance from wind in operation / out of operation		30/50 m/sec
Operating temperature range (outdoor parts of the equipment)		-50 °C to +50 °C
Operating temperature range (indoor parts of the equipment)		-10 °C to +50 °C
Range		from 0,5 to 256 NM
Antenna revolution		from 4,5 to 15 1/min
Antenna beamwidth in a horizontal plane (ASSR-20)		2,2° at -3 dB level 4,2° at -10 dB level
Sensitivity for SNR 10dB [dBm]		min. -83
Dynamic range [dB]		min. 70
Altitude resolution (mode C)		100 feet
Altitude resolution v all-call mode C/S		25 feet
Range accuracy [m]		±27 r.m.s.
Targets processing capacity [1/sec]		min. 125
Azimuth accuracy [°]		±0,1°
Output data format		ASTERIX Category 34, 48

## Display unit

standard system features. The display unit (SRDCD) is an



The display unit displays analogue radar signal, secondary radar signal, digital data, and other supplementary information on a high-resolution PC monitor. Basic functions of the radar can be controlled directly from radar site or from remote technical workstations using keyboard and trackball. Control and diagnostic system of the radar communicates with operator via well-arranged graphical menu. All information is displayed in windows that have

autonomous module that is connected to the system via LAN network.

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