CYRRUS

CYRRUS PRODUCTS LTD
Powering Clarity in Aviation Innovation

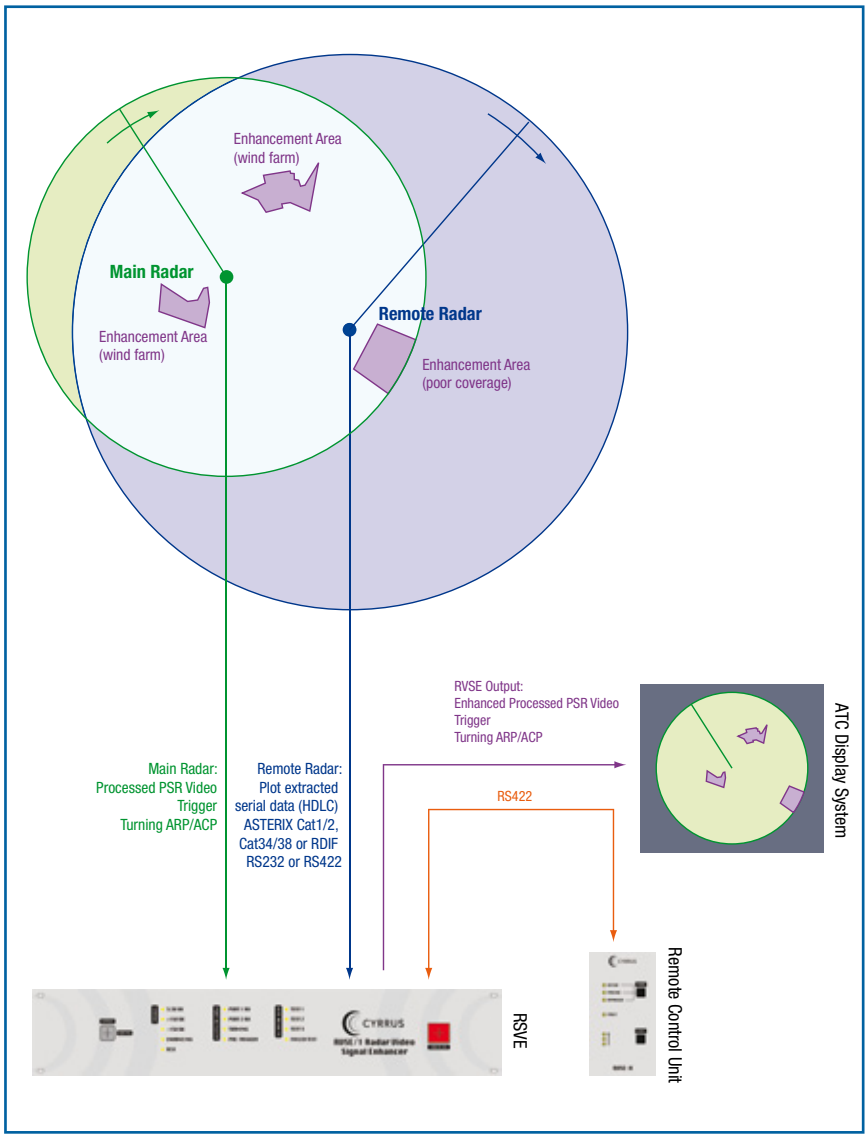
RADAR VIDEO SIGNAL ENHANCER

A Cyrrus innovation to enable air traffic control (ATC) approach radars to coexist with wind farms

- Wind turbine radar clutter removed from the controller's display
- Aircraft tracks over wind farms clearly and accurately presented
- Improved aircraft detection in areas of poor local radar coverage
- ATC operator has control of the level of enhancement
- Simple upgrade with no changes to existing equipment.

The **Radar Video Signal Enhancer (RVSE)** is a unique innovation in air traffic radar product design. Developed by Aviation experts Cyrrus.

The RVSE provides air traffic controllers with a clear 'radar video' presentation of aircraft tracks in the airspace over wind farms. Crucially, this leaves the display free of the clutter typically generated by wind turbines.



HOW DOES THE RVSE WORK?

- The RVSE is inserted into the processed video feed from the local approach radar to the display system
- The RVSE receives a serial data input from a remote radar, with coverage of the airspace above the wind farms that is not compromised by the turbines
- The RVSE is configured with 'enhancement areas' around wind farms or where existing radar coverage is poor
- The processed video from the local radar is attenuated inside the enhancement areas to pre-configured levels
- The RVSE generates synthetic video targets from the plot-extracted targets in the serial data message from the infill radar. Synthetic targets are inserted into the video input of the existing display system within the enhancement areas
- The synthetic video is presented seamlessly, as if it were coming from the existing local approach radar
- The ATC operator has a simple control panel which enables:
  - The enhancement process to be activated
  - The level of the local radar video in the enhancement areas to be selected
- The enhancement areas are displayed with a video outline to indicate the enhancement process is active within the boundary.

DESCRIPTION

The Cyrrus RVSE solves the problems of clutter and loss of visibility of aircraft on air traffic control displays caused by the effects of wind turbines on primary radar.

The processed radar video output from the local approach radar, together with the radar timing signals, are fed to the air traffic control video display system via the RVSE. The processing of the video as it passes through the RVSE includes:

- Attenuation of the video within the defined 'enhancement areas' around the wind farms;
- Insertion of a video outline for each of the enhancement areas whenever the enhancement process is active;
- Insertion of synthetic video generated from the target reports received from a remote radar for aircraft within the enhancement areas.

The RVSE is configured with up to four enhancement areas to define the wind farms or other areas where coverage from the local radar is enhanced by that from a remote radar. Each enhancement area is defined by a set of up to 20 points, each individually configurable to create a polygon.

The level of the local radar video within the enhancement areas is selectable by the controller at the remote control unit from a range of preset values established during system commissioning.

The remote radar needs to have visibility of the airspace above the enhancement areas without being adversely affected by wind turbines within those areas. The radar may be either a primary or a combined head, and may be either an approach radar or an en-route radar with a different turning rate. It must supply HDLC plot extracted serial data, either in ASTERIX or RDIF formats. The RVSE is able to filter out SSR-only target reports.

The RVSE tracks aircraft movements from the target reports over a wide area and converts these into synthetic video. Where the aircraft movements lie within the enhancement areas, this synthetic video is inserted into the video output to the display system. The position, timing, dimensions, intensity and orientation of the synthetic video is such that the controller is presented with a seamless transition of the aircraft's track as it passes through an enhancement area.

No modifications are needed to either the local radar or the radar data processing (RDP) and associated display system.

A dual redundant configuration is possible by using two RVSE units; one supporting the RDP A input and the other the RDP B input.

Each RVSE is controllable from up to four remote control units fitted in controller working positions.

The RVSE is configured from a laptop running HyperTerminal.

The accuracy of the synthetic video is determined by radar performance and system geometry. CAP670 3NM separation standard is achievable, subject to system performance assessment of these parameters.

The RVSE has a Bypass Mode where the local radar video input is connected directly to the output to the display system. This mode is entered by any of:

- BITE detection of a fault condition;
- Selection by controller at a remote control unit;
- RVSE front panel key-switch set to Bypass.

SPECIFICATION

Main Radar Processed Video Input
1.0 — 5 Vpk, positive or negative, 75Ω or High-Z

Main Radar Trigger Input
2.0 — 35 V, positive or negative, >1 µs, High-Z
PRF <20,000pps

Main Radar Turning (ARP & ACPs) Input
TTL compatible, RS232 or RS422, ≥ 1µs, 150Ω or High-Z
ARP polarity: positive or negative,
Turning rate 7.5 — 15 RPM
ACPs: 2^{10} — 2^{16} pulses/scan

Infill Radar Serial Data Input
HDLC, High-Z, RS232 or RS422
19.2, 38.4, 56, 64 or 128 kbits/s
ASTERIX Cat 1/2, Cat 34/48 or RDIF
150 target reports/sec, 7.5 — 15 RPM
Filter for unwanted target types

Video Output (Non-enhanced areas)
As at processed video input, ± 1 dB

Video Output (Enhanced areas)
Radar video attenuation - selectable configured values
Synthetic video dimensions & level configurable
Enhancement Area outline intensity configurable

Synthetic Target Accuracy
Compliance to CAP670 for 3NM Separation Standard assessed for specific system characteristics

Enhancement Areas
4 configurable non-overlapping polygonal areas
Each area defined by up to 20 co-ordinate points, co-ordinates definable to 1/64 NM

Operator Remote Control Units (RCU)
70mm wide 'P3' 3U sub-rack module
RS422 interface from RVSE to cluster of RCUs (Max of 4)
Mode selection: Enhancing (Active or Passive) / Bypass
Level selection of local radar video in enhancement areas
Indications of status and mode

RVSE Construction
2U 19inch rack mounted, 400mm deep
All connections to rear panel
Front controls: power switch & mode key switch
Front indications of status, mode & BITE

Remote Status Monitoring Output
Volt-free contacts for warning & alarm conditions

Power Supply
230Vac, 100VA

Operating Environment
0 to +40°C, 20-80% RH (non-cond.), to 3,500m

Storage Environment (when packed)
-40 to +70°C, 10-95% RH (non-cond.), to 15,000m

Regulatory Standards
Electrical Safety – 73/23/EEC, as amended by 93/68/EEC
EMC – 2004/108/EC (Immunity to EN61000-6-1, Emissions to EN61000-6-3)
Interoperability – EC/552/2004
CAP670, Part B, Section 3, SW01

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