

FERRANTI Display Systems



HEAD DOWN DISPLAYS & SYMBOL GENERATORS



MONOCHROME MULTIFUNCTION DISPLAYS

Ferranti has been prominent for many years in supply of rugged high brightness monochrome displays to meet the demanding requirements of military aircraft. Small cathode ray tubes exist in the Combined Map and Electronic Display (COMED) for the Tornado, F-18 Hornet, Jaguar and Harrier, as well as in Head Up Displays.

Head Down Displays have included the 1:1 Mini Monochrome and a versatile larger unit flown successfully in the Tornado. Low power, high brightness and resolution Multi Function Displays compatible with night vision goggles are among an expanding range of Displays, as in the Sea Harrier. Built-in test, EMC protection, autobrilliance and soft keys are usually incorporated.

COLOUR MULTIFUNCTION DISPLAYS

Colour assists in greater and faster differentiation and is especially useful for maps, colour cameras, video tape recorders (VTR), radar and in Electronic Flight Instrumentation Systems.

Ferranti has the latest photometric and colourmetric equipment with experience of computer assisted modelling to select the best combination of phosphor and filter for sunlight visibility. Ferranti has submitted units and collaborated with ergonomists at RAE and BAe, for improved formats and performance.

Units can be supplied with or without shadow mask and a variety of front panel filters according to customer requirements for performance. Several sizes and high resolution are possible with either high or medium brightness. The display units can take advantage of the superior performance of Ferranti Symbol Generators and Remote Map Generators.

DISPLAY SYMBOL GENERATORS

In parallel with display development FERRANTI has designed a range of compact display symbol generators which are capable of driving multiple display heads. The latest unit is extremely fast and does not require a picture repair facility, redrawing each frame instead of upgrading the old one.

A Comprehensive range of graphics with optional overlay or mixing of display data can be provided under individual software control, in addition foreground and background colours and intensity are independently selectable.

Dynamic formats have been produced for Electronic Flight Information Systems (EFIS) and special versions have been proposed for the particular requirements of helicopter formats.

FERRANTI
Display Systems

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HEAD DOWN DISPLAYS & SYMBOL GENERATORS

- Ferranti is a world leader in technologically advanced, highly reliable military systems.
- Ferranti head-up weapon-aiming sights are in almost every type of light strike aircraft, and thousands are in use throughout the world.
- Ferranti head-down projected map and multifunction displays are in the Harrier, Jaguar, Tornado, F18 Hornet, and A4 Skyhawk
- Ferranti inertial systems are in the Harrier, Phantom, Tornado, Sea Harrier, HS 748, Nimrod and Mitsubishi F-1, and are in production for Jaguar.
- Ferranti radars are in the Buccaneer, Sea Harrier and Lynx helicopter with major parts in production for Tornado.
- Ferranti Symbol Generators are in the Sea Harrier, A4 Skyhawk and ground installations with BAe, RAE and RSRE.
- Ferranti lasers are in the Harrier, Jaguar, Tornado and Draken.
- Ferranti helmet-mounted pointing systems are in production for use with the Tracked Rapier.
- Ferranti mission planners and automatic test equipment are in production for the RAF and the airforces of Germany and Italy.
- These systems, designed, developed, produced and tested by one manufacturer (with most of the components — from hybrid microcircuits to gyroscopes — also being produced in-house) are backed world-wide by one of Europe's largest military product support organisations.
- It is a capability few companies can match.

The logo for Ferranti Display Systems features the company name in a bold, serif font, with 'FERRANTI' on the top line and 'Display Systems' on the bottom line. The text is centered within a light blue grid pattern that consists of vertical and horizontal lines.

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FERRANTI Display Systems

MONOCHROME ELECTRONIC DISPLAY MED 2061

This compact, high brightness monochromatic display was initially designed for use in the JAGUAR aircraft. Since that time, variants of this unit have been fitted to BUCCANEER and HARRIER aircraft with successful results. The unit occupies an extremely small volume in an efficient manner and may be used to flexibly replace dedicated instruments or as a display for sensor data.

FEATURES

- EXTREMELY HIGH BRIGHTNESS
- DAY/NIGHT CAPABLE (NVG COMPATIBLE)
- PROVISION FOR REMOTE CONTROLS (TO FURTHER REDUCE PANEL IMPACT)
- BITE FACILITY (INCLUDING TEST GENERATOR)



SPECIFICATIONS

Luminance	2260 cd/m ²
Contrast	6 grey shades at 1.414 steps
Ambient Illumination	100,000 lux
Spot Size	0.4mm including raster jitter
Usable Screen Area	85mm × 65mm
Phosphor Type	P43
Video Input	CCIR Standard I 625 lines, 50Hz
Dissipation/Power	120VA/115 Volt 3 Phase 400Hz
Outside Dimensions	102mm(H) × 117mm(W) × 305mm(D)

Weight	4.5 Kg
Cooling	Self Contained
Temperature Soak	+90°C to -54°C
Temperature Operating	+55°C to -35°C
Altitude	+40,000 Ft
Vibration	BS 3G 100 Part 2, Section 3.1, Region B
Acceleration	BS 3G 100 Part 2, Section 3.6, Class 1B(ii)
Humidity	BS 3G 100 Part 2, Section 3.7
EMC	MIL-STD 461 B
MTBF (MIL HBK 217)	2066 Hours

FERRANTI Display Systems

MONOCHROME ELECTRONIC DISPLAY MED 2062

This modern, high performance monochromatic display was designed to be form and fit compatible with the company's moving maps — MMD and RPMD. As such, the display is well suited to fit the TORNADO aircraft, including the TORNADO IDS version which is currently in service with Ferranti map equipment on board. Versions of this unit have been flying in a UK TORNADO since December 1984.

FEATURES

- HIGH BRIGHTNESS FOR HIGH ALTITUDE VISIBILITY.
- DAY/NIGHT CAPABLE (NVG COMPATIBLE)
- TWO SWITCHABLE VIDEO INPUTS.
- SWITCHABLE ASPECT RATIOS (1:1 and 4:3)
- BITE FACILITY (INCLUDING TEST GENERATOR)
- 28 VOLT AND 60Hz OPTIONS AVAILABLE (MED 2064)
- LARGER SCREEN OPTION AVAILABLE (120mm × 120mm)



SPECIFICATIONS

Luminance	650 cd/m ²
Contrast	5 grey shades at 1.414 steps
Ambient Illumination	100,000 lux
Spot Size	0.4mm including raster jitter
Usable Screen Area	111mm × 111mm — or 120mm × 120mm
Phosphor Type	P43
Video Input	CCIR Standard I 625 lines, 50Hz
Dissipation/Power	180VA/115 Volt 3 Phase 400Hz
Outside Dimensions	173mm(H) × 176mm(W) × 359mm(D)

Weight	9 Kg
Cooling	Self Contained
Temperature Soak	+ 90°C to - 54°C
Temperature Operating	+ 55°C to - 35°C
Altitude	+ 40,000 Ft
Vibration	BS 3G 100 Part 2, Section 3.1, Region B
Acceleration	BS 3G 100 Part 2, Section 3.6, Class 1B(ii)
Humidity	BS 3G 100 Part 2, Section 3.7
EMC	MIL-STD 461 B
MTBF (MIL HBK 217)	4050 Hours

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MAP RELATED DISPLAY DEMONSTRATOR MANPACK

As a ground based demonstrator unit, this combined colour and waveform generator equipment was designed to evaluate suitability for troops in forward observation positions. Principle images would be from field radar and tactical maps to show the position and movement of troops and vehicles with mix and overlay of formats. Originally developed in collaboration with the Royal Signals and Radar Establishment of the UK Ministry of Defence, it provides the basis for future development of an enhanced system capable of similar performance including electromagnetic compatibility, but even smaller, lighter and lower powered operating to a full military specification.

This product is regarded as a forerunner for more advanced lightweight systems using improved materials and display media such as flat panels and sophisticated optics to maximise sunlight viewability whilst remaining undetectable by the enemy and compatible with night vision goggles.



SPECIFICATIONS

Low power (60 W)	Can operate for 90 minutes on 24V battery		
Low weight (10.5 Kg)	Robust metal case (5.0 Kg) Small 226mm diagonal CRT for 160 × 120mm screen (3.2 Kg) Minimum hardware (2.3 Kg)		
Small size	Compact monitor and integral waveform generator (198mm × 239mm × 355mm)		
Integral waveform generator	16-bit microprocessor Has 37 commands including power up/down, infill, colour, arc, line drawing, circle centre, character size selection, text windows and new symbol generation. Features double width lines to avoid interlace flicker. Low power using software infill drawing lines to boundaries, some CMOS ICs and few buffers. Fast update rate using programmable logic arrays		
		High resolution monitor	and two framestores (also allowing storage of two maps at once). 16 colours 768 × 576 pixels 4:3 aspect ratio Contrast enhancement filter Pigmented triad phosphor in black matrix Ruggedised in-line gun with self convergence and 60° deflection for minimum servicing, low power and low cost. Quick start cathode Magnetic shield High efficiency switched mode power supply.
		Comprehensive interfaces	Simple front panel controls (on/off, brightness, contrast) and 10 user defined keys for CMOS encoder to generate patterns RS232 link output Parallel input 25 way connector External Monitor output

FERRANTI Display Systems

DIGITAL MAP GENERATOR

The Ferranti Digital Map Generator (DMG) has been developed to meet the requirements of the next generation of combat aircraft and helicopters. From the outset of the design phase, the concept of the DMG has been aimed towards achieving the following principles:

- REDUCTION OF PILOT WORKLOAD
- ENHANCEMENT OF OPERATIONAL CAPABILITY
- INCREASED RELIABILITY
- IMPROVED FLEXIBILITY

The DMG will interface with advanced cockpit video displays and will provide the pilot with up to date navigation, tactical and intelligence information in easily assimilated formats.

To ensure that the highest degree of flexibility is maintained and world-wide coverage is available, the DMG will operate with either 3-dimensional data base information or a 2-dimensional chart digitisation. Where 3-dimensional data is available, the pilot will be provided with terrain elevation displays which will enable him to maintain the integrity of emission silent operations while achieving the tactical advantage of terrain screening even in the most hostile defence and climatic conditions.

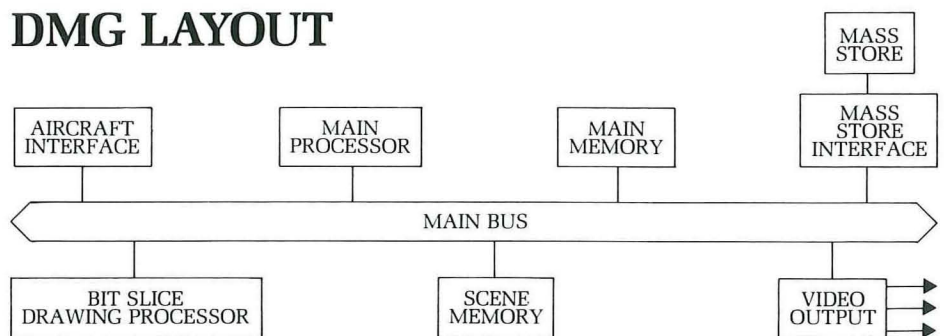
The map is generated from data which is stored in a mass store. Depending on coverage requirements, the mass store can employ solid state, magnetic tape or optical disc mediums.

DMG LEADING PARTICULARS

- 3/4 ATR SHORT
- LOW POWER CONSUMPTION
- LOW WEIGHT
- ARINC 429/MIL STD 1553B INTERFACES
- MTBF IN EXCESS OF 2000 HOURS
- VARIABLE DATA BASE PROCESSING
- INTEGRAL SYMBOL OVERLAY GENERATION



DMG LAYOUT



DMG OPERATIONAL FACILITIES

- MAP DECLUTTER
- FEATURE SELECTIVITY
- TERRAIN AVOIDANCE DISPLAY
- MULTIPLE MAP SCALES
- ZOOM
- COLOUR SET SELECTION
- TACTICAL DISPLAY OVERWRITE
- RAPID UPDATE
- LOOK AHEAD MODE
- TRACK HEADING NORTH UP ORIENTATION
- MANUAL SLEW
- TRACK FOLLOW
- WAYPOINT ENTER

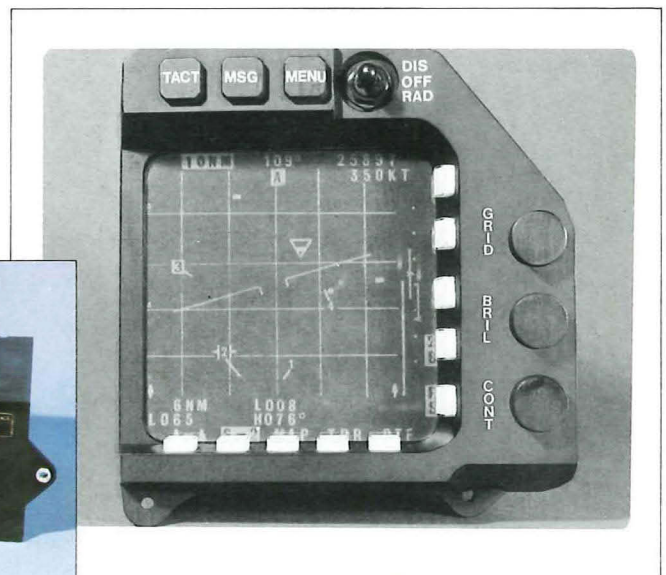
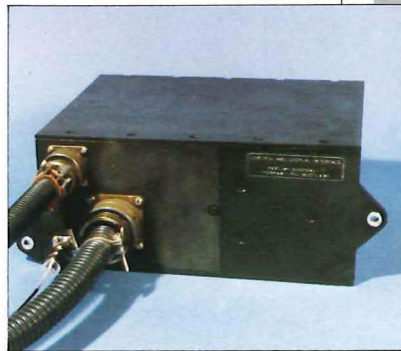
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DISPLAY SYMBOL GENERATOR FD 2011

This unit has been designed for production fit into the new version of UK SEA HARRIER. It has been designed to interface with the MED 2063 display which is also part of the new HARRIER display system. The Symbol generator accepts graphical and symbology commands from avionic equipments via the separate and fully redundant 1553 B buses. The embedded waveform generator is capable of drawing graphics primitives, such as arcs, circles, vectors and pre-defined symbology suites which can be drawn at several sizes.

FEATURES

- DUAL 16 BIT PROCESSORS
- VLSI THREE FRAME STORE SYMBOL GENERATORS
- FIBRE-OPTIC VIDEO INPUT.
- DIGITAL INTERFACE TO MED 2063 DISPLAY
- ANALOGUE INTERFACE TO HOTAS SYSTEMS
- TWO, DUAL REDUNDANT 1553 INTERFACES
- INTEGRAL MENU SOFTWARE
- BITE (INCLUDING INTEGRAL FAULT LOG AND TEST GENERATOR)



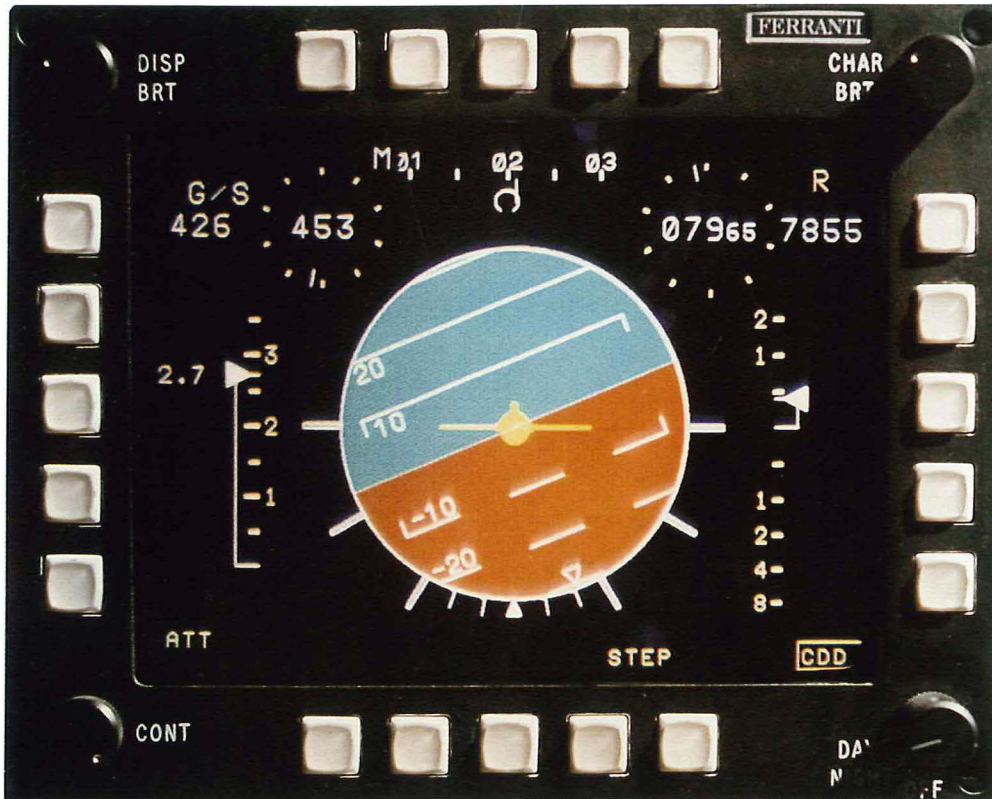
SPECIFICATIONS

Processor	Dual 68000	Temperature Soak	+90°C to -50°C
Memory	EEPROM, EPROM, DRAM	Temperature Operating	+55°C to -30°C
Frame Stores	3 Total with 2 Superimposed for output.	Altitude	+70,000 Ft
Video Output	CCIR Standard I 625 lines, 50Hz	Vibration	BS 3G 100 Part 2, Section 3.1, Region B, Cat 4
Interfaces — 1)	Radar 1553 Bus (optionally redundant)	Acceleration	BS 3G 100 Part 2, Section 3.6, Class 1B(ii)
Interfaces — 2)	Avionics 1553 Dual Redundant Bus	Humidity	BS 3G 100 Part 2. Section 3.7
Interfaces — 3)	Fibre Optic Video Link. See Note 1)	EMC	MIL-STD 461 B
Interfaces — 4)	HOTAS — Analogue and Discrete Inputs.	Power	MIL-STD 704C
Software	CORAL 66	Contamination	DEF STAN 07-55, Pt 2, Sect 3.1, C4, BS2011
Dissipation/Power	100W/28Volt DC	Salt Mist	DEF STAN 07-55, Pt 2, Sect 3.1, C2, BS2011
Outside Dimensions	254mm(L) × 114mm(W) × 199mm(D)	Mould Growth	DEF STAN 07-55, Pt 2, Sect 3.1, C1, BS2011
Weight	6.1 Kg	Flammability	BS 2011, Pt 2, Test Pz
Cooling	Self Contained	Waterproofness	BS 3G 100 Part 2, Section 3.11, Grade B
		Thermal Shock	MIL STD 810
		MTBF (MIL HBK 217)	in excess of 2000 Hours

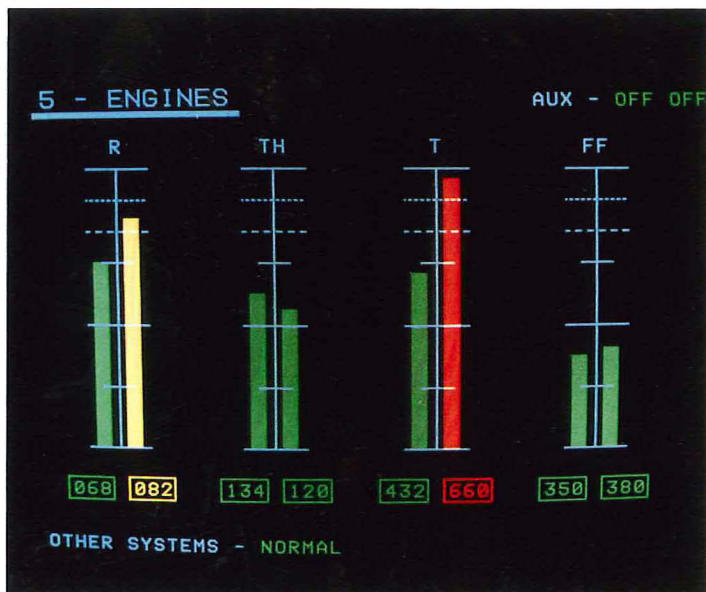
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PROGRAMMABLE DISPLAY GENERATORS

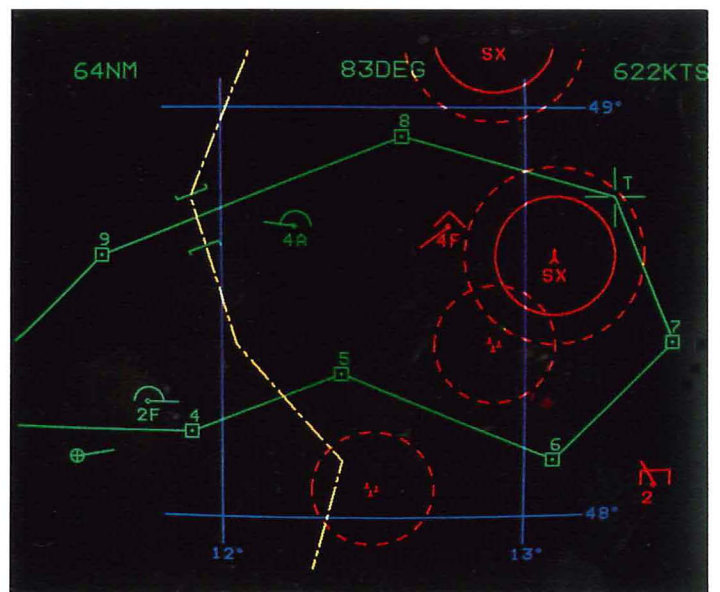
FERRANTI have built a great variety of programmable display generators for aircraft (eg. Sea Harrier), ground simulators (eg. B.Ae WARTON for EAP) and transportable map displays for the army. These generators cover all the requirements of Navigation, Digital Mapping, Flight Instrument Simulation, Terrain Avoidance, Radar and FLIR Display, Aircraft Management, Stores Management and Threat Avoidance. The following paragraphs describe the features currently available.



ADI in B.Ae EAP (Acknowledgement to B.Ae)



Engine Status



Tactical Map

SOFTWARE

The Programmable Display Generator is designed to be highly adaptable, allowing the production of customised formats with alphanumeric and graphic symbols in any size or style. To achieve this high degree of versatility, the VAX-hosted support tools have been designed to allow interactive specification of the symbols and automatic generation of PROMs and high level language source for the program interface. Multiple symbologies can be contained within one Program Display Generator for multi-function roles, including emulation of other aircraft in a training mode.

In addition to display format generation, the software within the PDG is capable of implementing MIL STD 1553B bus control and complex calculations such as Weapon Aiming and Navigation functions in both primary and reversionary modes.

All software is developed in Coral 66 or ADA using either commercial or proprietary software tools. Both symbol generation and high level language compilation tools are available for in-service support.

HARDWARE

Monochrome and colour displays (with a variety of colour palettes available) can be serviced simultaneously. One Programmable Display Generator can support both raster and cursive operation on multiple displays. The extent to which this facility is used will depend on a system compromise between cost, space and reversionary requirements. If the reversionary capability is unimportant, one generator could drive say, Head Up Display, 3 Head Down Displays and separate optical map projector such as the Ferranti COMED. Although this would give minimum cost for ground simulation, it is unlikely to be acceptable in an operational aircraft where more than one generator would be required to ensure that all display surfaces did not fail together due to battle damage.

Processors available include MIL STD 1750 A, Ferranti Proprietary and 68000.

The resulting system is fast enough to allow redrawing of each frame instead of updating the old frame.

TYPICAL UNIT

As previously stated, display generators are normally tailored to each customer's requirements, but a typical unit could be:—

CONFIGURATION	1/2 ATR Short Case
WEIGHT	7Kg
POWER SUPPLY	115V 400Hz or 28V DC
POWER CONSUMPTION	120 WATTS
OUTPUT CHANNELS	3 RASTER + 1 CURSIVE (SIMULTANEOUSLY)
RASTER STANDARD	625 LINE CCIR
RASTER RESOLUTION	768 × 576
CURSIVE RESOLUTION	1024 × 1024
INTERFACES	1553B DUAL REDUNDANT (Fibre optic link or HOTAS also possible)

For specific examples, see leaflets on FD2011 & also the Map Related Display Demonstrator Manpack. In the latter, the generator is built into the display unit itself.

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ROMAG - REMOTE MAP GENERATOR TYPE 2052

TACTICAL INFORMATION

The Ferranti ROMAG (Remote Map Generator) Type 2052 is an electronic unit which generates a television signal, representing a topographical map and is displayed on a multi-function display. The map, controlled by the aircraft navigation computer, indicates present position, route information, or other map data. A composite display can be produced by superimposing signals from other sources; for example graphics and text to produce flight plans and situation displays; or the scan converted output of a ground mapping radar can be superimposed on the map.



FEATURES

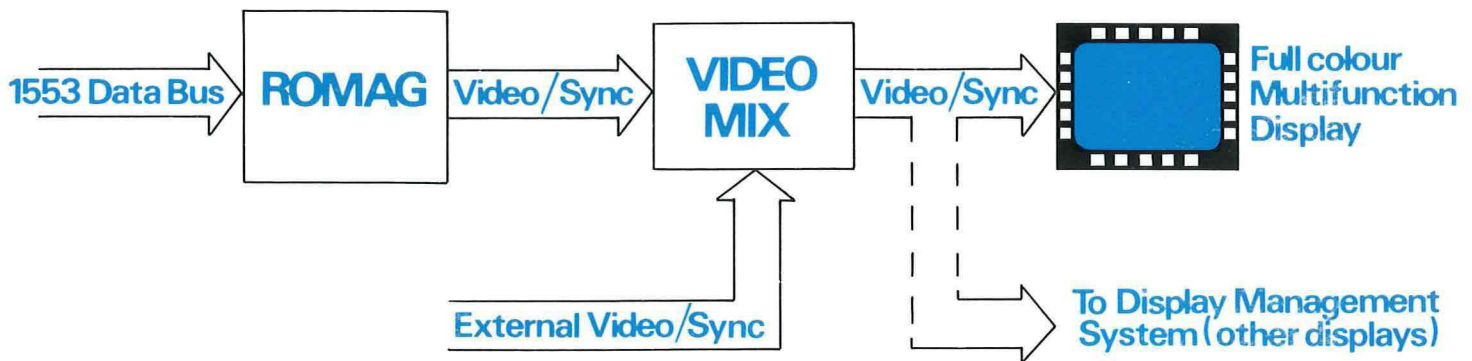
- Full topographical moving map without the need for a dedicated display
- ROMAG can be situated in the cockpit or remotely in an equipment bay
- Ruggedness and reliability based on use of proven in-service components developed from previous generations of highly successful Ferranti map displays
- Total modular design for ease of maintenance
- Five map modes:
 - North up
 - Track up
 - Track Decentred
 - Look Ahead (next destination)
 - Zoom
- Modular construction and automatic alignment enhances ease of map film strip change

OPERATIONAL FACILITIES

ROMAG can provide the following information:

- A colour topographical map at several scales; typically 2M, 1M, ½M, ¼M, and 1:50,000
- An indexed library of airfield terminal approach and departure charts
- A library of check lists and emergency procedures
- The topographical map can be combined at the CRT with external sensor information
- The map can be electronically annotated with intelligence or navigation data
- The zoom facility can be used for close inspection of map detail
- Night Vision Goggle compatibility is achieved by employing the monochrome facility
- An MFD control panel can be provided to perform the moding functions outwith the aircraft data bus
- Continuously monitoring self-test ensures high integrity of all outputs

TYPICAL SYSTEM



SPECIFICATION

Map Storage capacity	– 600sq ft (55.7sq m) of chart 57 feet of film (17.3m)	Inputs	– 1) Aircraft sync (optional) 2) MIL STD 1553B dual redundant bus ARINC 429 or any specified interface
Map Access Speed (Scale or strip change)	– 2 secs maximum	Power Input	– 115V 400Hz 3-phase 28Vdc
Magnification	– Typically 30% on a 5 inch display	Dissipation	– 150 watts
Zoom	– Up to 2 times overblow	Cooling	– Forced air 1.7lb/min (0.77kg/min)
Resolution	– 600 TV lines	Weight	– 28lbs (12.75kg)
Video Outputs	– 525/625 line format R.G.B. sync on green or separate sync. Signals comprise 0.7V P–P sync where appropriate into 75Ω	Dimensions	– ¾ ATR Short (7.6 x 7.6 x 12.5in) (193 x 193 x 317.5mm)
Aspect Ratio	– 4:3 or 1:1	MTBF	– 1100 hours
Grey Scale	– 8 shades with 1.4 to 1 brightness ratio on adjacent grey scales		