

# **VIDEO TRANSMISSION EQUIPMENT**

## **USER MANUAL**

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**OPT 800 Series Video Transmission Equipment**

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# INTRODUCTION

## Video Signals

Video signals have distinct formats for both duration and voltage levels which are defined by international standards. The industry standard for CCTV, CATV etc. applications is RS170.

This is a composite video signal consisting of front porch, synchronisation pulse, back porch and video signal. The RS170 standard refers predominantly to the voltage levels of the signal which is 1 volt peak to peak with 0.3 volts for the synchronisation pulse and 0.7 volts for the video signal. The 0.7 volts peak amplitude denotes the white level and the minimum signal denotes the black level. Figure 1 shows RS170 composite video signals with all white level and all black level.

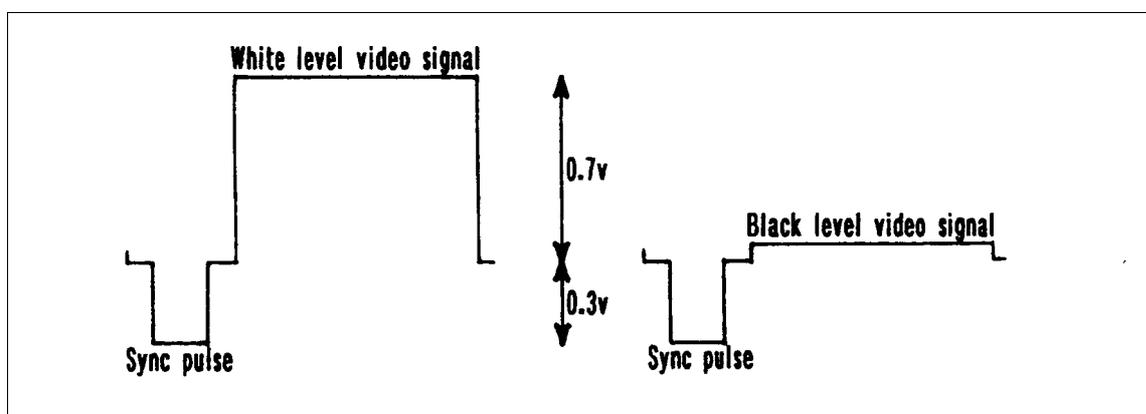


Figure 1: Typical video signal waveforms

This type of video signal is known as a baseband signal and is transmitted in this format onto a communications channel.

## Fibre Optic Transmission

Fibre optic transmission systems have now become an accepted method of transmitting high quality error free signals.

These systems have many advantages over traditional copper transmission systems such as:

- |                        |  |
|------------------------|--|
| Low Loss               | This allows long transmission distances without the need for launch Amplifiers or repeaters. |
| High Bandwidth         | High data rates or signal frequencies which is very applicable for video applications.       |
| Lightweight/Small Size | Aircraft/mobile applications and saving of space in cable ducts etc.                         |
| Electrical Isolation   | High voltage monitoring or control, eliminates ground loop and lightning problems.           |
| RFI/EMI                | No signal interference in electrically noisy environments.                                   |
| No spark hazard        | Can be used in potential explosive environments.   |

Security

Very difficult to locate and 'tap'.

### ***Video on Fibre***

Analogue transmission of video signals on optical fibre can be achieved in two ways:

Amplitude Modulation (AM)

Frequency Modulation (FM)

Both methods of modulation require the optical output device to be intensity modulated. AM is used predominantly with Light Emitting Diodes (LED's), which are intensity modulated at the baseband video signal level. FM is used predominantly with Lasers, where the baseband video signal is modulated onto an FM carrier signal which then intensity modulates the laser at that carrier frequency.

## TECHNICAL DESCRIPTION

### ***Introduction***

The 800 Series Video Transmission Equipment consists of single channel point to point video transmitters and receivers for video bandwidths of 10MHz for CCTV applications and 15MHz, 50MHz and 100MHz for High Resolution Video applications.

### ***Physical Description***

The 800 Series transmitters and receivers are available in:

- 1 to 3 channel 19" subrack mounted Euromodules (Fig. 2).
- 1 to 3 channel standalone units (Fig. 3).
- 1 channel modules for wall mounting **or** direct camera/monitor plug on (Fig. 4).

See Technical Specifications for physical dimensions.

### ***Power Supplies***

The 1 to 3 channel Euromodule transmitters and receivers require +12v and -12v DC which is supplied from the 3SR-A 19" subrack and mains power supply unit. This is provided via ribbon cables or via a DC power rail.

The 1 to 3 channel Standalone transmitters and receivers require 240/110v mains via a standard IEC plug.

The 1 channel Module transmitters and receivers require +12v DC via a flying lead.

### ***LED Indicators***

The 1 to 3 channel Euromodule and Standalone transmitters and receivers have LED indicators on the front of the units. One for +12v DC, one for -12v DC and one for the video signal on each channel.

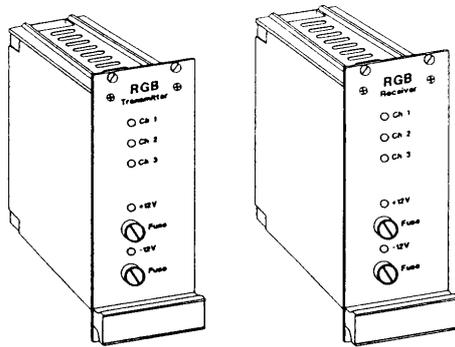


Figure 2: Transmitter/Receiver Euromodules

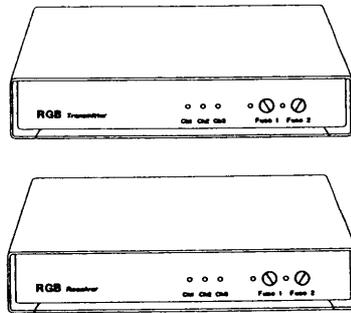


Figure 3: Transmitter/Receiver Standalone Units

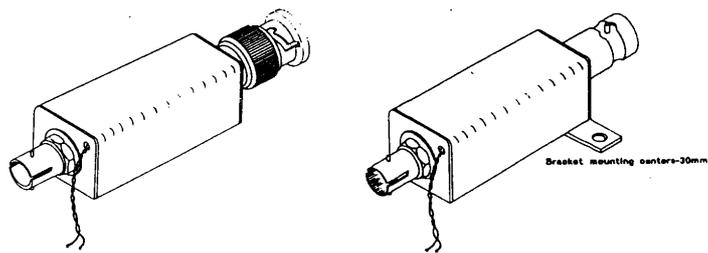


Figure 4: Transmitter/Receiver Modules

# OPERATION DESCRIPTION

## **Introduction**

The 800 Series Video Transmission Equipment consists of analogue transmitters and receivers which are AC coupled devices at an impedance of 75 ohms for transmitting RS170 (1 volt peak to peak) level video signals at bandwidths from 20Hz up to 100Mhz.

## **Transmitter**

The transmitters are available in 3 packages:

Euromodule (1-3 channel)  
Standalone (1-3 channel)  
Module (1 channel)

They are available in 4 bandwidths.

10NHZ  
25NHZ  
50MHZ  
100MHZ

They are available with 4 optical devices.

850 nm LED (-1SdB)  
850 nm LED (~13dB)  
1300nm LED (-13dB)  
1300nm LASER (-13dB)

The block diagram is identical for the different bandwidths and optical devices, but is different for the Euromodule/Standalone or Nodule variants.

The Nodule version consists of an impedance matching circuit followed by an input buffer amplifier and optical driver amplifier which directly intensity modulates the optical transmission device as in Fig. 5.

The Euromodule/Standalone version has exactly the same circuits as the Module but has voltage and signal level detector circuits for LED fault indication and a sync pulse injection circuit for external sync pulse requirements as in Fig. 6. This consists of a detect and shaping circuit to inject the sync pulse on channel 2 (green) during the video blanking period. For RGB system this sync can be switched via a sync inject switch to channel 1 (red) and channel 3 (blue) video signals for the receiver AGC circuits.

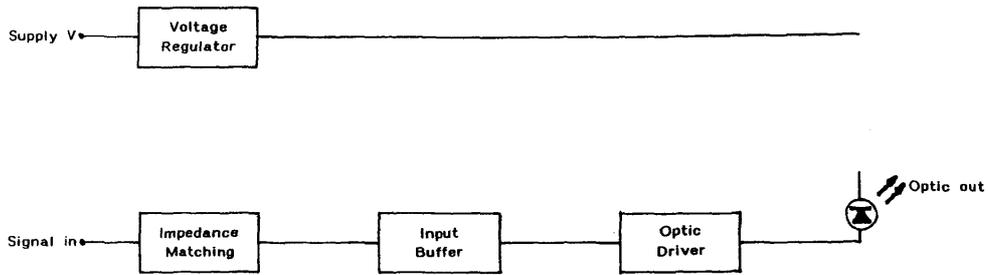


Figure 5: Transmitter Module Block Diagram

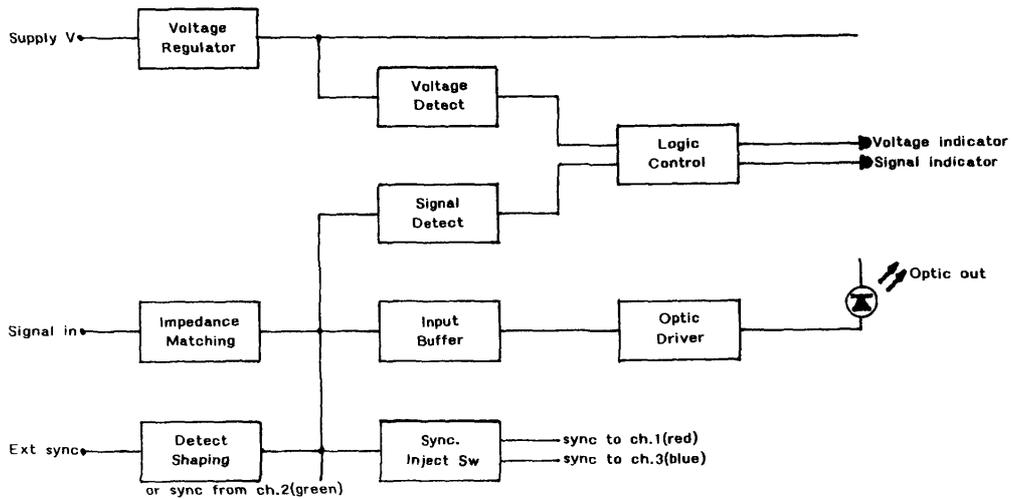


Figure 6: Transmitter Euromodule/Standalone Block Diagram

## **Receiver**

The receivers are available in 3 packages.

Euromodule (1-3 channel)  
Standalone (1-3 channel)  
Module (1 channel)

They are available in 4 bandwidths.

10MHZ  
25MHz  
50MHz  
100MHZ

They are available with 2 optical devices.

850 nm Photodetector  
1300nm Photodetector

They are available with 2 gain controls:

AGC - Automatic Gain Control MGC - Manual Gain Control

The Module receiver consists of a photodetector into a high impedance buffer circuit, through a high gain amplifier and out via an impedance matching circuit. There is a feedback loop via a sync pulse detector and control voltage circuit to the high gain amplifier for automatic gain control as shown in Fig. 7. The AGC control voltage circuit has a manual adjustment for setting the AGC threshold.

The Euromodule/Standalone receiver has exactly the same circuits as the Module but has voltage and signal level detector circuits for LED fault indication, as shown in Fig. 8.

The MGC (manual gain control) receivers are exactly the same circuitry as the AGC (automatic gain control) version without the AGC feedback loop as in Fig. 9. The gain level is a manual adjustment.

## **AGC**

The AGC is designed to keep the output level constant despite changes in optical fibre attenuation, transmitter output power or signal input level variations. It operates from the sync pulse level as this level stays constant despite changing video levels. For non composite (video only) signals such as radar etc. manual gain control units or external sync must be used.

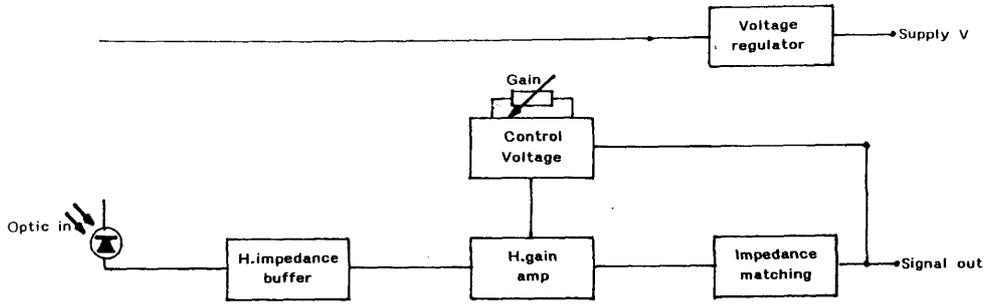


Figure 7: AGC Receiver Module Block Diagram

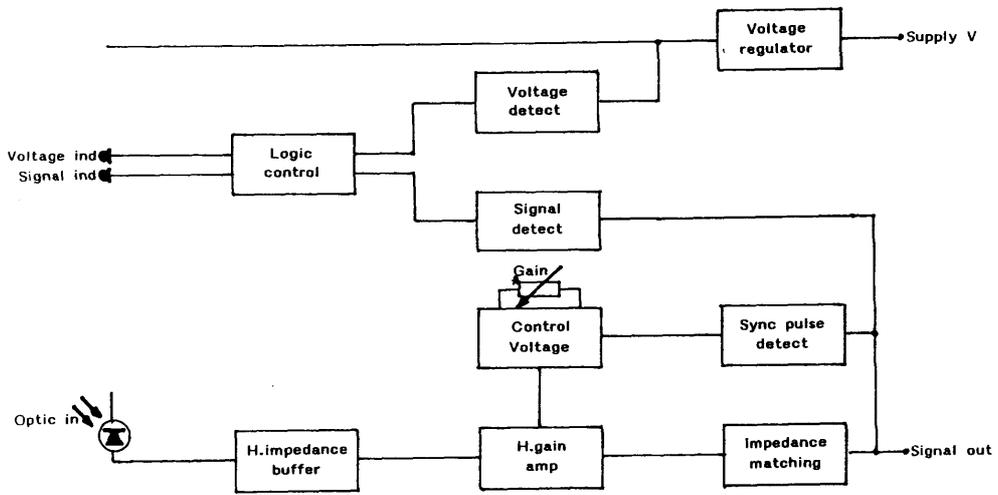


Figure 8: AGC Receiver Euromodule/Standalone Block Diagram

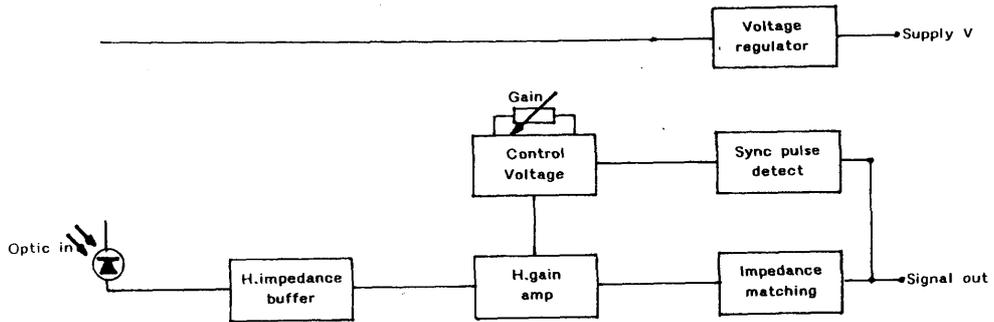


Figure 9: MGC Receiver Block Diagram

# INSTALLATION

## **Safety Warning**

- (a) Extreme care must be exercised when installing, adjusting, servicing or repairing the equipment when equipment is connected to the mains supply.
- (b) Any interruption of the protective conductor inside or outside the equipment, or disconnection of the protective earth (safety ground) terminal, is likely to make the equipment dangerous.

Before any other connections are made, the equipment must be connected to a protective earth (safety ground) conductor via a three core mains cable. The mains plug must be inserted only into a socket outlet provided with a protective earth contact. The protective action must not be negated by the use of an extension cord without a protective conductor.

The signal ground connections provided for interface of the data signals must not be used to connect the protective earth conductor.

- (c) Testing or operation of an optical transmitter may present potential hazards to test personnel from high levels of optical radiation. Care should be taken to avoid possible eye damage resulting from looking either directly into a laser light source or into the end of an optic fibre which is energised from such a source. No type of magnifying device should ever be used to look at such a source or fibre.
- (d) It is generally accepted that LEDs do not pose a health hazard. As a precaution never view the LED aperture directly (or with optical viewing aids), when the LED is energised, for more than 17 minutes from a distance of less than 35mm. Similarly, if the equipment is connected to an optical fibre, then this may not diminish the output power significantly and the same caution should be taken with the free end of the fibre. This may expose the eye beyond the maximum permissible level recommended in BS4803.
- (e) If there is any suspicion about the equipment not being safe, do not put it into operation.
- (f) BMW CONSULTANTS assume no responsibility should the equipment be used in any way other than specified.

## ***Introduction***

This section provides installation instructions for the 800 Series Video Transmission Systems and also includes information regarding the initial inspections, damage claims, preparation for use, cabling, interfacing, packaging shortage and shipping.

## ***Delivery and Initial Inspection***

Within seven days of delivery of goods the buyer should inspect and test the goods and should give notice to BMW CONSULTANTS in writing of any damage, defect, discrepancy or shortage. If goods arrive damaged, the container and all original packing material should be retained to comply with such conditions as to notice in respect of damage, defect, discrepancy or shortage as may be required by the carrier.

Any failure to give such notice within the specified period shall bar any claim in respect of goods by the buyer, and the goods shall be deemed to have been accepted by the buyer.

## ***Preparation for Use***

The following check should be carried out before the equipment is connected to the mains supply.

The 19 inch 3U sub-rack should be mounted to ensure a free flow of air around the equipment. All cards should be checked for correct seating in the subrack (front panel should all be flush).

## ***Optical Cables***

The cable must be installed in such a way as to minimise stress and to ensure that the specified minimum bend radius is not exceeded.

## ***Signal Input/Output Cables***

The signal cables connected will be specific to the interface cards used. Connectors fitted with screw locks (such as some D type connectors) should be correctly attached to the corresponding fittings on the backplanes.

## ***Fibre Optic Connectors***

The fibre optic input/output connectors should always be protected by a dust cap when not connected to the optical fibre, to guard against contamination by dust or mechanical damage. Dust contaminated optical connectors can be cleaned by compressed air or gas.

## ***Mains Voltage Selection***

Units for operation in Europe are factory set to accept a mains supply of 220VAC to 250VAC.

Units for operation in USA are factory set to accept a mains supply of 120VAC.

Other operating voltages are available on request.

## **Fuses and Fuse Ratings**

The 800 Series Standalone units and the Euromodule subrack is connected to mains (240 or 110v) via an industry standard IEC320/CEE22 mains socket mounted on the rear panel of the units. The main socket is fitted with 2A anti-surge fuse. A spare fuse is incorporated into the housing.

The Standalone and Euromodule units have +12v and -12v D. C fuses fitted to the front panels of the units (see fig.10) rated as follows:

Transmitter	Fuse 1	20mm +12v/600mA
	Fuse 2	20mm -12v/100mA
Receiver	Fuse 1	20mm +12v/600mA
	Fuse 2	20mm -12v/400mA

The module transmitter and receiver requires +12v DC supply via flying leads and have no fuses.

## **Connector Type**

The connectors for all units are identical for transmitters and receivers.

### Standalone (Rear Panel)

Electrical Signal in/out	-	BNC 75ohm socket (1 per channel)
Optical Signal in/out	-	ST standard (1 per channel)
Power Supply	-	IEC mains socket

### Euromodule (Rear Panel)

Electrical Signal in/out	-	BNC 75ohm socket (1 per channel)
Optical Signal in/out	-	ST standard (1 per channel)
Power Supply	-	10 pin IDC socket from subrack

### Module (Front Panel)

Optical Signal in/out	-	ST standard
Power Supply	-	2 wire flying lead

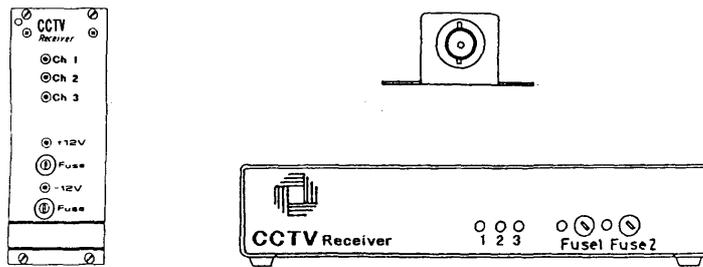


Figure 10: Front View of 800 Series Units

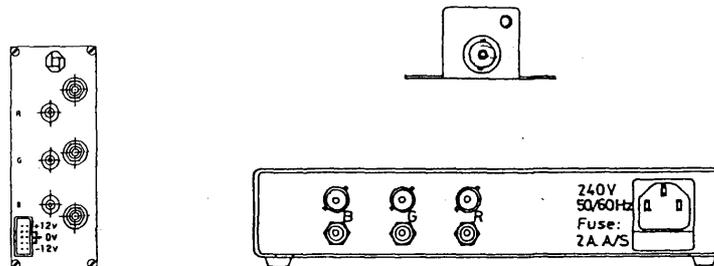


Figure 11: Rear View of 800 Series Units

# SERVICING

## ***Introduction***

The information below provides sufficient information for an experienced technician to locate and correct common problems encountered during installation or operation of the equipment.

No attempt should be made to service this equipment other than by BMW CONSULTANTS personnel or an appointed service agent.

N.B. Removal of any covers invalidates any warranty agreements.

## ***Normal Operation***

The Standalone and Euromodule units are fitted with diagnostic LED. Under normal operation these LED's should be indicating green as the following:

+12v -	indicates for correct presence of +12v dc
-12v -	indicates for correct presence of -12v dc
Ch 1/2/3 -	indicates that video signal is present on the particular channel

The Module units have no indicator LED's and external measuring equipment is required to determine correct operation.

## ***Setting UP Procedure***

The AGC units are designed as 'plug in and work' systems and therefore require no setting up. Although the sync pulse voltage level is adjustable, it is factory set for correct operation at 0.3v (RS170 standard).

It is therefore important that the video input sync pulse is 0.3v to ensure correct operation of the units.

For example: If the sync pulse is too large the AGC will scale down the sync pulse to 0.3v which will also scale down the video signal by the same amount therefore causing degraded signal quality.

If the sync pulse is too small the AGC will scale up the sync pulse to 0.3v which will also scale up the video signal by the same amount until it reaches the peak to peak voltage level crowbar, therefore causing the signal to ramp up and down the crowbar.

## ***Fault Finding***

Simple diagnostics can be carried out by checking that the diagnostic LED's are indicating correctly for DC voltage supplies and presence of video signal. These LED's indicate only that a video signal is present and do not check for correct video or sync pulse levels.

To carry out further fault finding the following test equipment will be required:

- 100MHz Dual timebase oscilloscope
- Video Test pattern generator
- Optical power meter
- Terminated optical patch lead
- Coax leads and 'T' piece 75ohm terminator

To carry out a basic functional test of the units the following procedure should be used:

Connect a signal from the test patten generator, (see fig.12), to channel 1 of the oscilloscope via a 'T' piece and onto the video channel under test of the transmitter.

Ensure that +12v, -12v and channel video LED indicators are lit.

Connect the video channel optical output of the transmitter to an optical power meter via the optical patch lead and measure the output power.

Ensure that the optical output power is to technical specification for the particular model.

Connect optical patch lead from transmitter to receiver optical input of channel under test.

Ensure that +12v, -12v and channel video LED indicators are lit.

Connect the channel receiver output via a 75ohm terminator to channel 2 of the oscilloscope.

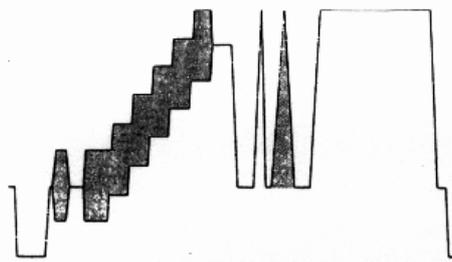
Ensure that output signal on is the same as input signal on channel 1. For RGB systems channel 1 (red), channel 2 (green) and channel 3 (blue) level must be of equal levels.

On AGC models, AGC voltage level control may be re-adjusted to ensure output sync pulse level is 0.3v peak to peak.

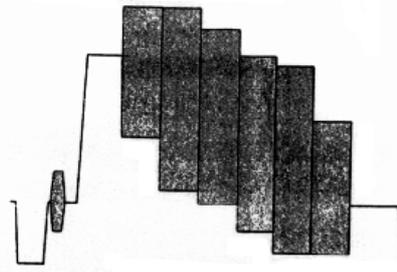
An MGC models, gain will need to be adjusted for 0.3v peak to peak sync pulse level each time a fibre optic link is connected. See Fig. 13 for adjustment points.

For some RGB systems the sync pulse is external or 'sync on green'. This sync pulse is required to be 'injected' onto the red and blue channels for the receiver AGC. This is done by selecting transmitter internal sync switch for red and blue to on.

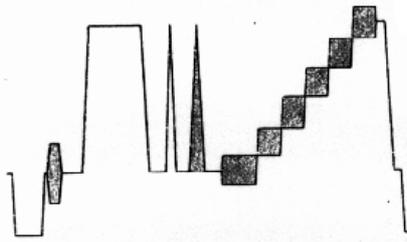
This transmitter internal sync switch must be switch off for video signals that already have a sync pulse. (Composite video signal). See Fig. 14 for AGC sync switch position.



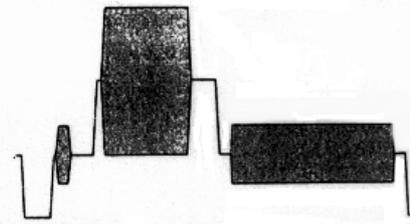
FCC Composite Test Signal



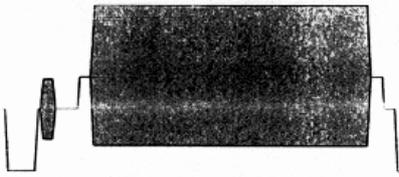
Colour Bar 100% 100/0/100/0



UK National (Lines 19 and 332)



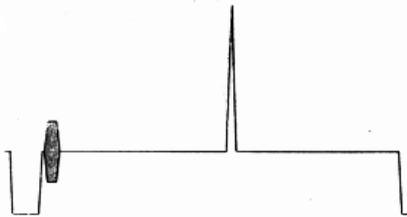
UK National (Lines 20 and 333)



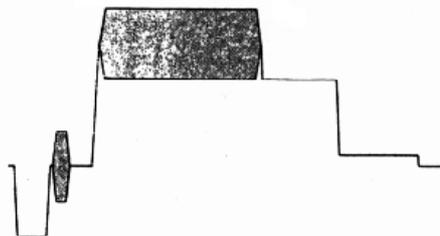
Red bar (75% saturation)



250 kHz Squarewave



2I reflection signal



Vertical Interval Reference Signal (VIR)

Figure 12: Typical Video Test Patterns

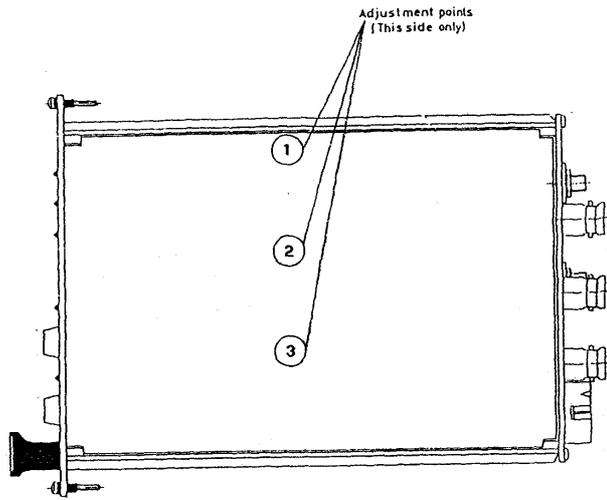


Figure 13: Gain Adjustment Points

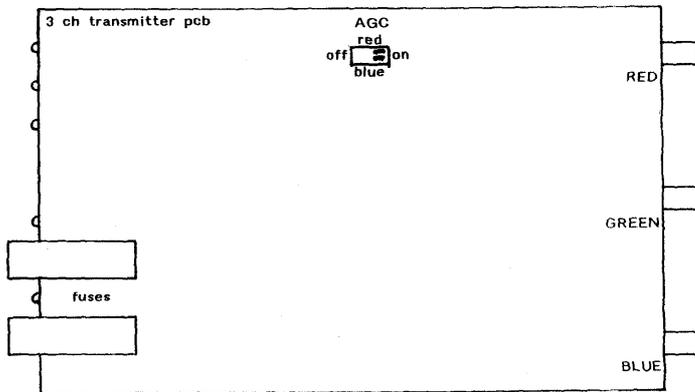


Figure 14: 3 Channel Transmitter AGC Sync Inject Switch

# MAINTENANCE

## ***Introduction***

The units were designed for exceptional reliability and do not require regular maintenance. The following points should be observed and checked to prevent unnecessary failures.

## ***Optical Connectors***

When an optical fibre is disconnected from an optical input/output connector, both connectors should be protected with dust **caps** to prevent mechanical damage or contamination.

## ***Fibre Optics Connections***

The optical fibre terminations should be checked periodically for tightness to ensure the correct fitting to input/output connectors. All fibre optic connections should be 'finger tight' only. Extreme force, for instance by using a fixed spanner, can cause damage to the PIN/LED device inside the input/output optical connector.

## ***Electrical Connections***

Interface connectors should normally be held in place by securing screws (D type connectors) **or** bayonet fitting (BNC connectors) **so** should not work loose.

## ***Dust and Airflow***

Prevent dust from collecting on the equipment and maintain a sufficient airflow around the equipment to ensure long trouble free operation.

# WARRANTY

## ***Introduction***

BMW CONSULTANTS assumes responsibility for the equipment sold hereunder to be free from defects in materials and workmanship for a period of 12 (twelve) months from the date of delivery. BMW CONSULTANTS will replace or repair, at its option, any equipment which in its judgement is defective, provided:

1. The equipment has been subjected to normal use and service.
2. The defect is not due to damage occurring after the original acceptance of the goods by the Buyer.
3. The equipment has not been altered or modified by persons unauthorised by BMW CONSULTANTS or not in accordance with instructions furnished by BMW CONSULTANTS.
4. All transportation and insurance charges for the return of the equipment to BMW CONSULTANTS service and repair facility have been prepaid by the Buyer.

BMW CONSULTANTS will pay return shipping expenses for the repaired equipment, including the cost of insurance, provided the equipment proves to be defective and is within the limits of the warranty. Otherwise, the Buyer is liable for all handling, shipping and insurance costs.

Defective equipment may be returned to BMW CONSULTANTS during the 12 month warranty period, subject to a Return Material Authorisation (RMA). The RMA number must be obtained from BMW CONSULTANTS Sales Department.

## ***Liability***

BMW CONSULTANTS shall not have liability or responsibility to the customer or any other person or entity with respect to any liability, injury or loss caused or alleged to be caused directly or indirectly by products and equipment sold by BMW CONSULTANTS, including but not limited to any interruption of service, loss of business or anticipatory profits or consequential damages resulting from the use or operation of such. It is the responsibility of the Buyer to determine the suitability of the products for their intended use.

BMW CONSULTANTS liability for breach of warranty under any contract or otherwise, shall not exceed the purchase prices of the specific product shipped and against which a claim is made.

This warranty is in lieu of all other warranties, expressed or implied, and no representative or person is authorised to represent or assume for BMW CONSULTANTS any liability in connection with the sale of our product other than set forth herein.

## **Assistance**

For repairs outside of warranty service or after the warranty period, charges will be the prevailing authorised repair prices. Product maintenance agreements and other customer assistance agreements are available for BMW CONSULTANTS products.

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# TECHNICAL SPECIFICATIONS

## General

Transmission Type	Analogue AN/FN
Video	Baseband
Bandwidth	20Hz - 10NHz, 25MHz, 50MHz,
100MHz	
Signal Compatibility	RS170, RS343, NTSC, PAL

## Performance

Video Input Level	1V peak to peak
Signal to Noise Ratio (unweighted)	54dB (10NHz)
Differential Gain	5%
Differential Phase	5%
Return Loss	-30dB

## Optical Transmission

Output Power (850nm LED 1)	-16dB
Output Power (850nm LED 8)	-13dB
Output Power (1300nm LED)	-13dB
Output Power (1300nm Laser)	-13dB
Receiver Sensitivity	-27dB (for 54dB S/N)
Connector Type	ST (PC laser)

## Operating Environment

Storage Temperature	-20°C to +85°C
Operating Temperature	-0°C to +55°C
Relative Humidity	92% (non-condensing)
Power Consumption (Transmitter)	+12 (2W) per channel -12 (0.2W) per channel
Power Consumption (Receiver)	+12 (1.2W) per channel -12 (0.6W) per channel

## Mechanical

Standalone Unit (3 channels)	230 x 195 x 50mm
Euromodule (3 channels)	3U x 160mm x 6HP
Module (1 channel)	89 x 21 x 19mm

# PART NUMBERS

## OPT 800 Series

Part Number 8 \* \*- \* \*

### Function/Channels

- 1 - 1 Channel Tx
- 2 - 2 Channel Tx
- 3 - 3 Channel Tx
- 4 - 1 Channel Rx
- 5 - 2 Channel Rx
- 6 - 3 Channel Rx
- 7 - 3 Channel Tx with Sync

### Package & Power

- A - Standalone 240V
- B - Standalone 110V
- E - Euromodule
- M - Module
- c - Camera Plug-on

### Bandwidth/Gain

- 1 - 10MHz AGC
- 2 - 10MHz MGC
- 3 - 25MHz AGC
- 4 - 25MHz MGC
- 5 - 50MHz AGC
- 6 - 50MHz MGC
- 7 - 100MHz AGC
- 8 - 100MHz MGC

### Optics

- 1 - 850nm LED (-16dbm)
- 2 - 1300nm LED
- 3 - 1300nm Laser
- 4 - 1550nm Laser
- 5 - 850nm Laser
- 6 - 850nm LED SMA
- 7 - 1300nm LED SMA
- 8 - 850nm LED (-13dBm)