

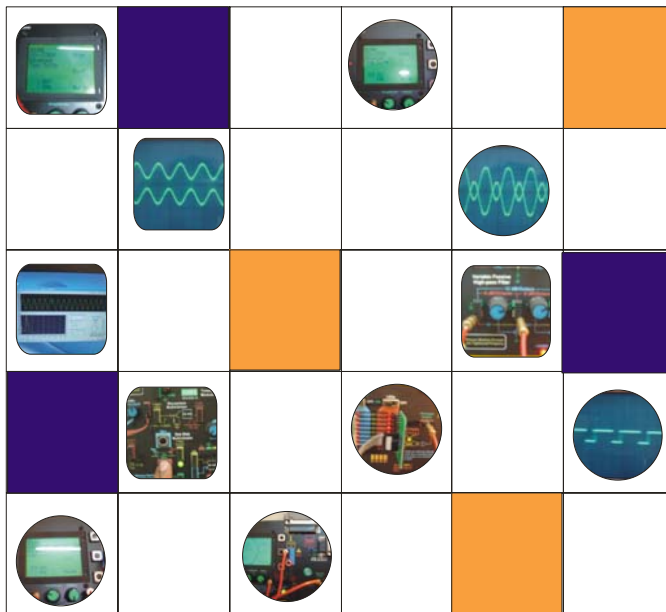
**RIMS**Research Instrumentation  
& Measurement Systems

DEV-2739

# Advanced Color TV Trainer

**Operations Manual**

PART NO. 2739-00-301



**COMPREHENSIVE & ILLUSTRATED  
EASY EXPERIMENTS STARTUP  
LAB MANUAL**

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Once you have made it through this guide, you will have a firm grip on your lab experiments and operations of the RIMS product you are using. How to get your training equipment operational, basic maintenance and setting up desired experiments will just be a breeze. Everything you need for a quick and easy start is presented here—useful hints and tips makes it simple to conduct your lab and hands-on training sessions. We are happy that you have joined our vast community of over 30 thousand valued users, which grow as we bring you the latest technology at most competitive prices. We value your business and hope that you will enjoy being an important member of the RIMS Education Community.

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**EU, USA and Canada**  
Weston Villa, 37 Wolsey Road, Esher, Surrey  
United Kingdom KT10 8NT  
[www.rims-tech.co.uk](http://www.rims-tech.co.uk)

**Middle East & Asia Pacific**  
632-B Chakala Scheme-III Rawalpindi  
Pakistan 46000  
[www.rimsedu.com](http://www.rimsedu.com)

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## LEARNING OBJECTIVES

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# WHAT YOU SHOULD KNOW AFTER READING THIS MANUAL?

- Rims Part Numbers, How To Order And Get Support For Your Trainer
- About Rims Copyrights, Basic Signals Know How And Recognizing Them On Oscilloscope
- Didactic System
- Front Panel
- Malfunction Solving
- Analysis Of The Voltages Of The Power Supply And Start/Stop
- The Fault Simulator With Switches
- Fuses And Protections
- Use Of The TV Trainer System
- Safety Precautions

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## General Information

- Understanding RIMS part numbers
- Signals Terminology

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1

UNDERSTANDING RIMS PART NUMBERS?

Normally the trainer packaging contains the part numbers that you have ordered. You must understand the order number system for checking your packing note or even for later re-ordering of the equipment.

Trainer	-	Prefix	-	Sub-Category
DEV-2739	-	00	-	101

CODE	PF	SUB	Description
DEV-2785			Advanced I
DEV-2785	M	001	Trainer DEV
DEV-2785	00	101	Power Ca
DEV-2785	00	331	Softw
DEV-2785	00	301	Use

Trainer name is the broad category e.g., 2739 is a  $\mu$ -Controller Based Trainer

The trainer has a prefix that represents the model Number of trainer e.g., 'M' or 'N'

Sub assembly is the hardware component that can be connected to the trainer some modules are compatible with other trainers as well but the part number would only be related to the trainer for which the have been designed

CODE	PF	SUB	Description
DEV-2785			Advanced I
DEV-2785	M	001	Trainer DEV
DEV-2785	00	101	Power Ca
DEV-2785	00	331	Softw
DEV-2785	00	301	Use

Category is most important feature of this numbering. The under lying structure for category is same for all rims products, the category list is given here,

001-100	Hardware ID
101-200	Cables & Accessories
201-300	Special Attachments
301-400	Data Pack and Media
401-500	Services, Freight and Installations
501-600	Extended Warranties

Here are some common sub categories

101-110	Power Cord
111-120	Interconnecting aids & Data buses
121-130	Dust Covers
131-140	Bread boarding accessories

CODE	PF	SUB	Description
DEV-2785			Advanced I
DEV-2785	M	001	Trainer DEV
DEV-2785	00	101	Power Ca
DEV-2785	00	331	Softw
DEV-2785	00	301	Use

141-150	Specialized Power Cables
151-160	Extensions and boards
161-170	Cables Serial and Parallel
171-180	Specialized Cables
301-310	Operation Manuals and User Guide
321-330	Experiment Manuals
331-350	SOFTWARE
401-410	Services, Freight and Installations
501-510	Extended Warranties

Please use the appropriate order code for either re-ordering components or the equipment from RIMS. The list is subject to further change without altering the existing structure. Please visit RIMS website for any further details about the updates on support pages.

## 2

## SIGNALS TERMINOLOGY

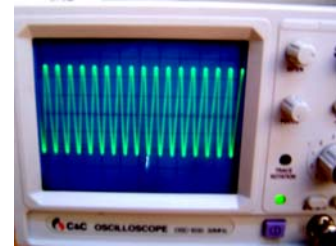
Following terms are used for various signals

**Frequency**

Number of cycles per second

**Carrier Signal**

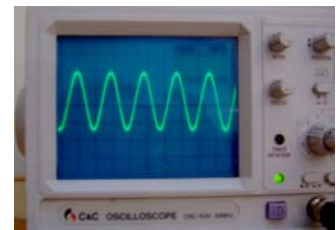
Signal that is used as base for carrying signals over long distance usually high frequency signal



Carrier

**Modulating Signal**

Signal that is being modulated such as audio or low frequency signal relative to carrier



Modulating Signal/ Audio Signal

**Modulated Signal**

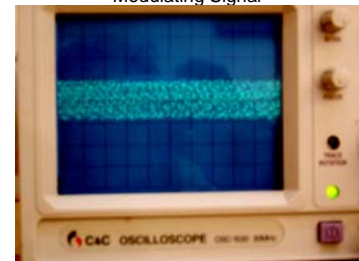
Signal after modulating on the carrier



Modulating Signal

**Noise**

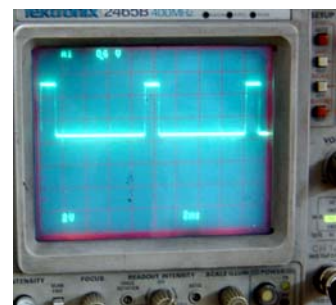
Uncertainty or randomness in a signal that is represented by sufficient statistics such as mean, variance etc.



Noise

**Clock**

TTL or square wave for digital control



**Voltage**

A certain level of signal fixed and not varying e.g., 2.3Volts

**Drift**

Slowly varying noise (undesired signal)

**Offset/Bias**

DC level in a signal

**Keying**

Shifting frequencies within discrete levels

**Audio Signal**

Normally 300-3500Hz for communications application. Audible range is 20-20KHz, but the telephonic bandwidth is one given above. Above 10KHz and below 300Hz is considered as HI-FI (high fidelity)

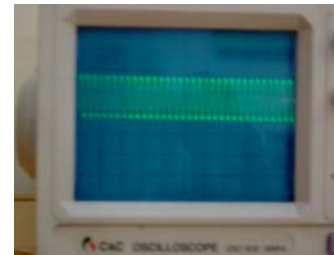
**Sampling Frequency**

Rate at which a signal is digitized by a analog to digital converter

**Power**

Signal for driving the devices and running the system electronic, while other electronics signals are referred to as signal

Clock/Pulse



Offset/DC Level in AC Signal

**3****DIDACTIC SYSTEM****Assignment Level**

For the Television Trainer there are at least three levels of assignments considered, which are:

**CONCEPTUAL**

The trainer is operated at the level of an advanced receiver user and the fundamental signals that intervene in each functional block are analyzed.

**2nd LEVEL**

A detailed study of all signals and voltages that intervene is performed, deepening in the study of the circuits that configure each functional block.

**3rd LEVEL**

Resolution of malfunctions provoked through the simulator, resorting for that to the studied methods of diagnostic and localization.

For first level assignments, the trainer incorporates a front panel with a generic block diagram of a TV receiver and measuring points for signals and voltages of the most significant inputs and outputs. In this way, the student can perform a functional analysis of the different processes that take place in the receiver with ease and quickness, acquiring the fundamental concepts of television. As a complement to the conceptual level, second level assignments can be performed. These consist of a detailed analysis of each circuit using real equipment and components, together with a diagram. Service adjustments are also considered at this level. The third level provides instruction in the diagnosis and location of malfunctions inserted by the Instructor. To achieve this, malfunction simulator lever switches are provided which is part of the trainer.

The student learns to diagnose accurately to find the location of the circuit and the component causing the malfunction, applying the appropriate methodology. The

final result is a flow diagram that has been drawn during fault localization. The following chapter gives an example of a flow diagram drawn during fault isolation procedures.

Thus, in the presence of an anomaly which is visual, audible or both, the students deduce if they know enough of the operation of the circuits to diagnose what is the cause. The answer makes them review their knowledge or select the method most appropriate to identify the element that causes the malfunction. The students will make a measurement plan in the circuits they believe the malfunction is in until its final location is found.

The most appropriate method for the location of the faulty component once the nature of the malfunction is deduced (in the raster, in the video, in the supply, etc.) is creating a flow diagram prior to the execution of the proofs. With the symptoms and the help of electronic schematic of the device, the points to be measured and checked and the rectification that could be taken in terms of the result of the measurement are established. This method of designing the initial strategy and establishing the following checkpoints in terms of the result is ideal and it is suggested that it is applied during at an early stage.

## 4

### FRONT PANEL

#### **Description**

The front panel of the trainer incorporates a set of signals for the conceptual or first level assignments. This allows the student to acquire a clear concept of the operative function of each block, as well as its most representative input and output signals.

**5****MALFUNCTION SOLVING**

In accordance with all malfunction diagnosis and localization methods, the purpose of the Malfunction Simulator is to allow the students to get the terminal capacity of correct diagnosis of the block first and then the discrete component that cause the anomaly.

**Naturally, the final solution is not component replacement, since it would be necessary to include destructive malfunctions in the trainer. However, the system allows the diagnosis and the localization, which is truly important.**

It is suggested that the Instructor requires the student to make a flow diagram that shows the steps followed in the localization of the faulty block first and then the component. It would have little value from a didactics point of view that the localization had been obtained by simple indiscriminate confirmation.

Provides lists of malfunctions that can be set, together with associated symptoms, area of the faulty components.

A toggle switch to the ON position, the malfunction listed is introduced into the trainer.

**6****ANALYSIS OF THE VOLTAGES OF THE  
POWER SUPPLY AND START/STOP****LEVEL 2 Practices**

Objective: Measure the supply voltages and display their curls with and without load and analyze the start/stop circuit.

**INFORMATION****Rectifying malfunctions:**

If the remedial measures listed below do not lead to a satisfactory result, please consult RIMS. Please consider that problems can also be caused by external appliances, such as video recorders and satellite receivers.

Malfunction	Possible causes	Remedy
Picture bright (interference) but no pro-	Aerial cable	Aerial cable connected?
	No TV channel programmed	Start automatic channel search
Picture contrast poor	Picture settings adjusted wrongly	Adjust settings for brightness, contrast and color
	Problem is with the transmitter	Test another channel
Picture and/or sound disturbed	Malfunctions caused by other appliances	Change the position of the appliances
Ghosting, reflection	Channel settings	Automatic or manual channel setting/ fine honing
	Aerial	Have aerial cable or aerial system checked
No color	Color intensity set to minimum	Raise the color setting
	TV standard setting (if setting options available)	Select the correct color standard
	Problem is with the channel	Test another channel
Wrong colures, colored flocks	Strong magnetic field from speakers or similar	Increase the distance between the speakers and the TV set if the colored spots remain, turn the TV set off at the mains and turn on again after 10 minutes
Picture visible, no sound	Volume set to minimum	Increase/ switch on volume
	Headphones connected	Remove headphones
	Problem is with the channel	Test another channel
Remote control not working	No optical connection	Direct remote control at the TV set
	Remote control batteries	Check/replace batteries
	Undefined operating status	Turn TV set off with the main status
After switching on, 'PARENTAL LOCK*' menu appears	Child-proof lock is activated	Enter PIN or digit combination »7038«

**7****THE FAULT SIMULATOR WITH SWITCHES**

As we have already mentioned in the previous paragraphs, the fault simulator with switches does not foresee a keyboard, but a panel with lever switches, the teacher can insert the faults to be simulated by accessing to the panel and setting one or more switches.

The latter can be clearly identify from the numbers corresponding to the order numbers of the faults, as it is listed in the relevant section of this manual.

The normal position of fault off of the switches is obtained by moving the lever towards low and therefore the normal operative arrangement of the trainer is with all the switches down.

**8****FUSES AND PROTECTIONS**

The connection of the trainer to the mains is by means of a removable cable. The trainer mains connector, placed on the back side is equipped with fuse-holder. The fuses to be used are 2A, fast blow.

The differential magneto technique switch of the trainer protects both the circuits of the TVC and the auxiliary sockets for the instruments. The differential switch is adjusted at 30 mA.

The TVC supply circuit is protected by a 3.5 A fast fuse, assembled on the main board of the TVC itself and accessible from the trainer front panel.

**9****USE OF THE EQUIPMENT**

This manual is a very good example of technical literature destined to the final users. The students are invited to examine these pages carefully for at least three valid reasons: To practice with the functional specific aspects of the TVC in prevision of the following practical tests.

To familiarize with the performances, the characteristics and the use modalities offered by the most recent models of TVC. (Some details could vary from a trademark to another, but there are many elements in common.

To obtain a general view of the way to present the customer a technical product by means of clear, rational and of easy use documents.

Final note: some information contained in the practical Manual are obviously valid only for the original version of the TVC and that have not to be considered after the transformation in the trainer version, he students are invited to identify and to do their considerations about these differences.

**10****SAFETY PRESCRIPTIONS**

Check, before connecting the equipments that the mains voltage corresponds with the voltage shown on the plate on the back of the trainer.

After the unpacking check the trainer carefully for eventual transport damage that make the use unsafe. Make sure that air can flow freely through the air-cooling slits of the trainer.

Do not place the trainer near a heat source (radiator, etc.)

Do not place the trainer near equipments with powerful magnetic fields (motors, transformers, etc.). Do not set the trainer on an unsafe support.

Do not use the trainer in dusty environment or in places subject to vibrations.

Avoid the penetration of objects or liquids through the air-cooling slits of the trainer, in the case some liquid penetrates the trainer; disconnect it immediately from the mains.

If the trainer has to be transported, remove the external connections and protect the television CRT and the other fragile parts from the impacts.

Do not expose the trainer at rain and dampness.

No not operate the trainer without protection covers.

## DEV-2739 EXPLAINED

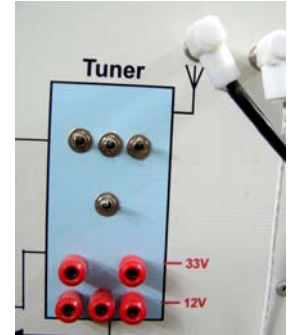
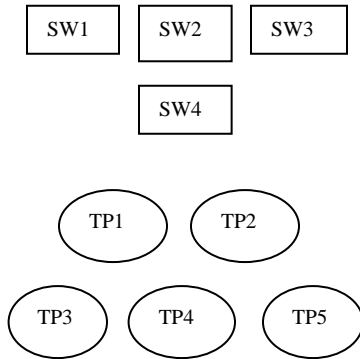
1. Tuner
2. VIF Stage
3. Video Demodulator
4. AGC
5. I.R. Receiver
6. F.M. Demodulator
7. Audio preamp and output
8. Chroma processor
9. Luminance Processor
10. 4.43 MHz
11. ACC
12. Phase Control
13. Demodulator Chroma
14. Matrix
15. Sync Separator
16. Vertical OSC; driver and output stage
17. Horizontal Osc; Driver, and outputs
18. FBT
19. E.H.T
20. Power Supply

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Product Title: RIMS Color TV Trainer  
Document Code: DEV2739-00-301  
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1	TUNER
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Contains 5 test points TP1 to TP5 & 4 lever switch sw1 to sw4.



As read in the text, Tuner is also called “Front End” of the T.V. set. As it receives the RF signals, Amplifiers RF signal, produces a local oscillator & mix it to produce an intermediate frequency signal, known as IF signal band switching is done via a switching IC controlled by a microprocessor, according to the following table.

Band	Pos	Result
VL	H	VH
VH	L	
VL	L	VL
VH	H	
VL	L	UHF
VH	L	

Details of the switches & corresponding test points is as under

Switches and Text Points	Details
SW1	State changing switch (Low/High) for UHF.
SW2	State changing switch (Low/High) for VH.

SW3	State changing switch (Low/High) for VL.
TP3	UHF Band check TP.
TP4	VH Band check TP.
TP5	VL Band check TP.

Students to check, with the help of volt meter, the state of voltage at corresponding TPs to get a better idea of Band switching

**TP1:** It is test point for AGC voltage check, which is a DC feedback voltage from V.I.F stage, its corresponding switch, to change the state, is located in BLOCK 4.

**TP2:** Varicap/ varictor voltage, check with help of voltmeter the tuning voltage variation from 0V to 30V dc, for tuning in of different frequencies.

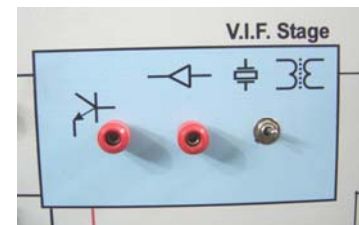
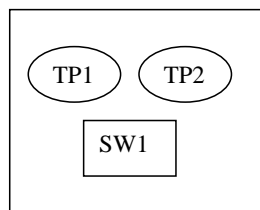
**SW4:** Is the lever switch for the state changing of varicap voltage (tuning voltage).

## 2

### VIF STAGE

#### Contains:

1. Lever switch SW1
2. Test points TP1 & TP2.



**TP1:** Check with the help of an oscilloscope the I.F signal coming out the tuner unit & being in put to V.I.F pre amplifier.

**TP2:** Amplified signal coming out of pre Amp; & SWF (surface wave filter).

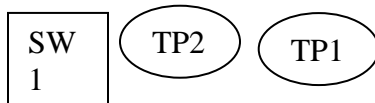
**SW1:** State changing lever switch, to observe the absence of V.I.F input signal & watch the symptoms of no sound, No picture.

## 3

## VIDEO DEMODULATOR

**Contains:**

1. 2 test points TP1 and TP2.
2. 1 Lever switch SW1.



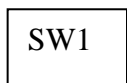
Signal coming out of I.F stage after amplification are now fed to demodulator where the carrier signal is removed, check with the help of oscilloscope. At TP1 and TP2 and observe the symptoms by simulating fault by suspending the signals through SW1.

## 4

## AGC

**Contains:**

Lever switch SW1.



This is a feedback to R.F Amplifier in tuner unit, from I.F stage, D.C voltage of about 3V to 5V, Observe the symptoms of snowy picture by simulating fault through SW1.

**5****I.R. RECEIVER**

Normally 5V, goes to low level 2V, when the Infra red signals (I.R. Signal) is received from the remote control. Connect CRO (cathode ray oscilloscope) to TP1 and switch the oscillogram while pressing different keys of the remote control.

TP1

**6****F.M. DEMODULATOR****Contains:**

1. 3 Test points.
2. 1 Lever switch.

TP3

TP2

SW1

TP1



The sound I.F. signal is fed to S IF. Amplifier to be checked with the help of an oscilloscope at TP1.

Detected signal is present on TP2, check with oscilloscope.

Simulate fault by SW1 and check oscillogram at TP1, TP2 & TP3 respectively. Also listen to the speaker.

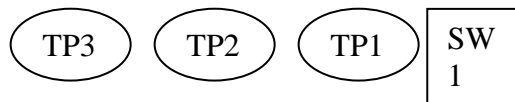
TP3 contains sine wave output ready to be fed to Audio Amplifier for Amplification (check with oscilloscope).

## 7

## AUDIO PREAMP AND OUTPUT

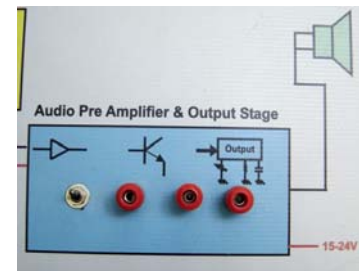
**Contains:**

1. 3 Test points i.e. TP1, TP2, and TP3.
2. 1 Lever switch.



**SW1:** Can disconnect, FM Det. From preamp at TP1 the Audio signal can be checked TP2 is the muting signal from system control/ microprocessor, which goes low and high respectively according to command.

**TP3:** Output signal at the output end of Audio output Amplifier check with help of CRO/ AC volt meter.



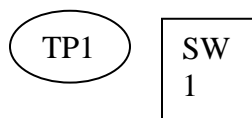
## 8

## CHROMA PROCESSOR

**Located:**

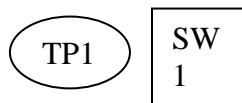
In this block is a test point and a lever switch.

On TP1 the very important keying pulse (for details see Text) also call "Sand castle" pulse is given, check with the help of an oscilloscope and insert fault by SW1 and record observation.



**9****LUMINANCE PROCESSOR****Located here:**

1. 1 Test point
2. 1 lever switch

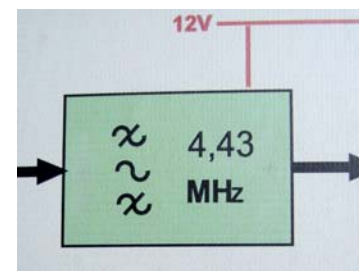


The composite video signal output from video processing stage, containing sync & chrome signals as well (for detail see text book) is present on TPI check with the help of an oscilloscope and observe the symptoms both on oscilloscope and T.V. Screen.

**10****4.43 MHz**

Since this signal is of very ultra high frequency i.e. approximately 4.43 MHz and is produced locally, (for details see text) this signal cannot be displayed on front panel of the trainer as the extra length of wire changes the frequency of the signal and results in loss of color, details and wave shape of the signal is contained in this manual.

4.43 MHz



**11**

ACC

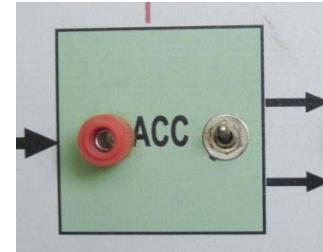
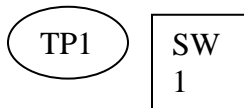
**ACC:**

Automatic Color Control.

**Located here:**

1. 1 Test point
2. 1 lever switch.

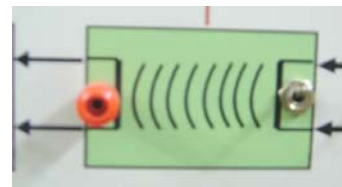
The auto colors control voltage is present on TP1, check with the help of C.D.C bolt meter and observe the fading of color and record the change of voltage by inserting fault through SW1.

**12**

PHASE CONTROL

Located in this block are one test point and a lever switch.

Check the phase of the color signal on TP1 with help of an oscilloscope and insert fault by means of SW1. Record your observation also checks dc voltage.

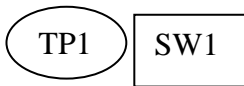
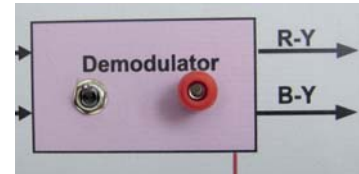


13	DEMODULATOR CHOROMA
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**Located here:**

Here is one test point and one lever switch.

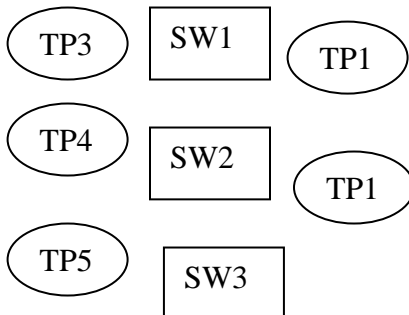
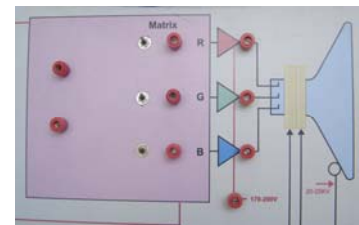
Check the signal with the help of an oscilloscope and observe closely the wave shape, before and after the closing and opening of SW1.



14	MATRIX
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**Located Here:**

1. 5 test points
2. 3 lever switches



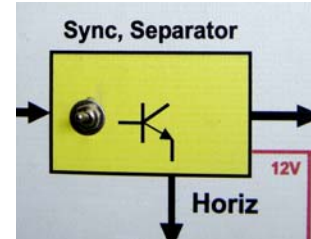
Color signals are fed and Amplified in this section TP1 and TP2 contains B-Y, R-Y input, which is input via SW1, SW2 and SW3 to color Amplifier, signal of each color can be suspended by means of SW1, SW2 and SW3 and wave shape of the color signals can be checked on TP3, TP4 and TP5 respectively, also watch the screen of the T.V trainer for a great change of color.

# 15

## SYNC SEPARATOR

**Located Here:** is a single switch to disconnect the sync sight (see text). To be fed to vertical oscillator and horizontal Oscillator. Stages and watch the screen for the fault.

SW1

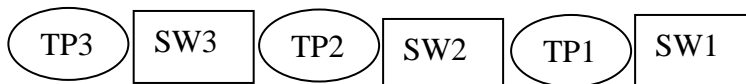


# 16

## VERTICAL OSC; DRIVER AND OUTPUT STAGE

**Located Here:**

1. 3 test points TP1, TP2 and TP3.
2. 3 lever switches SW1, SW2 and SW3.



Vertical oscillator saw tooth pulse can be seen with the help of an oscilloscope on TP1 and can be interrupted by SW1.

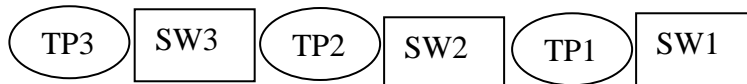
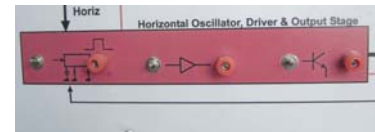
Vertical drive pulse is present on TP2 and can be checked by oscilloscope. Similarly the final vertical pulse, ready to be supplied to deflection yoke coil's vertical scanning pain, is present on TP3 can be inspected on oscilloscope and T.V. Screen be observed for a bright horizontal line by inserting fault through lever switches.

**Warning:** before operating lever switches in this section always lower the brightness level of picture to prevent damages to the phosphorous coating of picture tube.

## 17

HORIZONTAL OSC; DRIVER, AND  
OUTPUTS**Located Here:**

1. 3 test points TP1, TP2 and TP3.
2. 3 levers switch SW1, SW2 and SW3.



Here Oscilloscope frequency can be seen with the help of an oscilloscope on TP1 and SW1 is used to deactivate the Horizontal Osc; stage.

**TP2:** contains signals present at the collector of her driver transistor and can be seen on oscilloscope SW2 deactivated this circuit making this circuit to fail and result in the absence of EHT (see text).

**TP3:** Displays the final wave shape, ready to be fed to the horizontal pair of the deflection yoke used for the deflection of electron beam to be scanned on the pictured tube excessive high voltage to be supplied to the Anode of CRT (cathode ray tube) or (TV Screen).

**18**

FBT

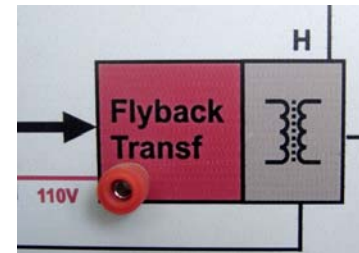
**Located Here:**

One TP1 on which the D.C operating voltage of fly back transformer can be measured by means by means of a volt meter two more following voltages are also presented in this section

1000V – 15000V for screen grid of CRT  
4000V – 5000 Volts for focusing voltage of CRT

Since these voltages are very high and can extremely dangerous therefore not supplied on front panel of trainer.

TP1

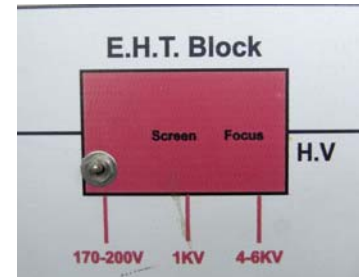


**19**

E.H.T

This section converts the approx 20,000-25,000 volts of Ac voltage into D.C voltage.

For the anode of CRT .this excessive high tension (E.H.T) cannot be given on front panel for being extremely dangerous



“170V Switch”

This switch suspend the supply voltage it's the collection of output amplifier transmission, the impact can be seen the picture.

#### “Cathodes of CRT”

Three triangles shown here, conation and three test points, check the final going signal to the cathodes of respective colures of CRT. These signals contain video and colures signal.

20

POWER SUPPLY

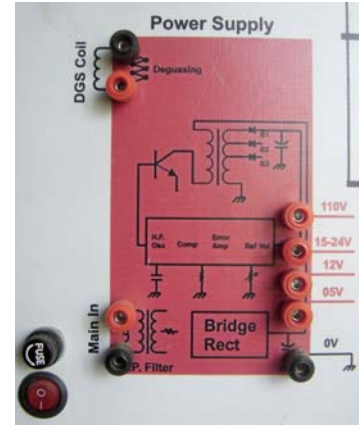
Located here ix test points: detailed hereunder

**TP I & TP ii:** - These two points are for degaussing check (see text) A.C Voltage is present here which goes high only for a few second when the TV is turned ON:

**TP iii & TP IV:** - These two points are main AC line input to the T.V Trainer. Can be checked for 220V AC by Voltmeter.

**TP v –TP ix:-** these test points containing D.C voltages written against them respectively .TP ix is ground of chassis, all voltages are measured with respect the ground i.e. TP ix.

**Warning:** - You must care should be taken while working in this block as these voltages are extremely fatal.



O TP I			
Degaussing			
O TP ii			
	TP V	O	110V
	TP VI	O	15-25V
	TP vii	O	12V
O TP iii	TP viii	O	5V
220v	TP ix	O	0V
O TP IV			



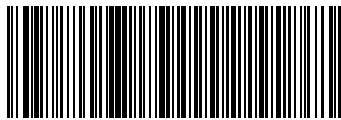
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Weston Villa, 37 Wolsey Road, Esher, Surrey  
United Kingdom KT10 8NT  
[www.rims-tech.co.uk](http://www.rims-tech.co.uk)

**Middle East & Asia Pacific**

632-B Chakala Scheme-III Rawalpindi  
Pakistan 46000  
[www.rimsedu.com](http://www.rimsedu.com)



\*DEV2739-00-301\*

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