THE FORGESTONE COLOUR TELEVISION RECEIVER

SETTING-UP AND ALIGNMENT INSTRUCTIONS

INTRODUCTION

The following alignment procedure has been devised to enable the receiver to be set up for optimum performance without the need for sophisticated test equipment. Although there may seem to be a large number of steps, the procedure is quite straightforward provided that the adjustments are carried out in the order given. Many of the adjustments are carried out using the displayed picture. It is essential therefore to carry out alignment using a colour test card transmission. The aerial must be adequate to provide a more or less noise-free picture.

YOU SHOULD ALSO PAY ATTENTION TO THE SAFETY ASPECT, BECAUSE THERE ARE MANY LIVE POINTS IN ANY COLOUR RECEIVER. THE LINE TIMEBASE AND THE CRT BASE PANEL ARE PARTICULAR DANGER AREAS, BUT EVEN ON THE DECODER PANEL WE HAVE THE VIDEO OUTPUT TRANSISTORS AND ALSO THE RGB THICK FILM UNIT HEAT SINK OPERATED FROM A 200V LINE. THERE ARE THREE IMPORTANT STEPS TO BE TAKEN TO ENSURE SAFETY. FIRST, THE RECEIVER CHASSIS SHOULD BE EARTHED. SECOND, A MIRROR SHOULD BE USED TO VIEW THE SCREEN SO THAT YOU CAN BE BEHIND THE SET AND THEREFORE SEE WHERE ADJUSTMENTS ARE MADE. FINALLY, THE RECEIVER SHOULD ONLY BE LEFT RUNNING WHEN ACTUALLY MAKING ADJUSTMENTS. IT SHOULD BE SWITCHED OFF WHENEVER COMPONENTS OR LINKS ARE ADDED OR REMOVED.

A useful extra hint when doing any work on live equipment is to keep one hand in your pocket all the time.

EQUIPMENT REQUIRED

A Multimeter with a sensitivity not less than 10,000 Ohms/volt, a diode probe, make up (as fig.14) a 1n (1000pF) disc ceramic capacitor, EHT meter,* crosshatch generator, and a 680Ω Resistor (the small parts are in the Sundries pack).

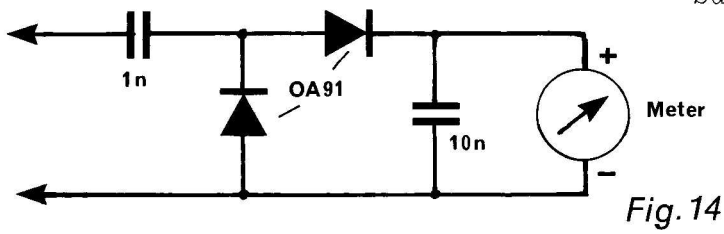

Fig. 14

* We can arrange the hire of a suitable EHT meter for a small charge.

PROCEDURE Do not proceed unless step 9 of Power Supply construction on page B2 has been satisfactorily carried out.

INITIAL CONTROL SETTING

1. On the convergence panel, set the three A1 voltage controls RV14, RV15, and RV16 to minimum, the beam switches ON and all other controls approximately midway.
2. On the timebase panel, set the line drive VR6 to minimum (fully clockwise) and all other potentiometers to mid-position. Connect the flying lead on R54 to the line output transformer Pin 9.
3. On the decoder panel, set the beam limiting control RV2 fully clockwise and all other preset potentiometers to mid-position. Remove the cores from the notch filters L1 and L2. Set the cores of L3 and L5 approximately level with the tops of the formers. Do not adjust L4 or L7. Connect TP4 to chassis.
4. On the I.F. board, set RV1 fully anticlockwise set the cores of L2, L3, L4, L5, and L6 level with the tops of the formers. Connect a 680Ω resistor across L2.
5. On the power supply unit, set R13 fully anticlockwise.

6. On the front panel, set the Brightness, Contrast, and Saturation to minimum.

7. On the scan coil assembly, set the purity ring magnets with the alike lugs in line with each other. Loosen the scan coil wing-nuts and set the coils to the mid-position.

8. Connect the EHT meter to the tube final anode connection, following the instructions provided with the meter. Connect the multimeter on the 50V d.c. range from P3 (+ve) on the power unit to chassis.
Check that the aerial is connected.

9. Remove the H.T. fuse F2 from the power unit.

10. Set the mains input tap to the appropriate voltage tapping on the mains transformer.

11. Switch the receiver on and adjust R13 on the power unit for +40V at P3.

12. Check the voltage at P5 on the power unit which should lie in the range 11.5 to 12.5V. If the voltage is greater than 12.5V switch off and fit a resistor R8 on the power unit in place of the link. This resistor is not supplied in the kit as it is only required in a small proportion of receivers.

13. Switch off and replace the fuse F2.

14. Switch on, watching carefully for any sign of overheating or flashover as the valves warm up, if any occurs switch off at once. Advance the Brightness control until some sort of screen illumination is seen. Advance the contrast control until a grainy effect is seen indicating that the receiver is working.

15. Switch off the AFC on one of the tuner push-buttons, depress the button, and tune it in to the Test Card transmission. There will be no colour at this stage, but a monochrome display of sorts will be seen.

16. On the timebase board, set the field hold VR1 and line frequency VR5 to stabilise the picture.
Connect a shorting link across the two 'set osc' pins near the TBA920 I.C. Adjust VR5 until the picture is as near stationary as possible.
On removing the link the line timebase should lock correctly.

17. Turn down the brightness so that the screen is black. Turn the Line Drive control VR6 until the EHT reading is 25KV. When carrying out this adjustment, do not allow the EHT to exceed 25KV even for a short period, as this may cause damage.

NOTE A crackling sound may be heard coming from the CRT as the EHT is varied, and when the receiver is switched on or off. This is quite normal.
A static charge also tends to build up on the tube face at times, causing crackles if a hand is brought near to it. This again is normal.
A single sharp 'crack' from the tube, after which the set continues to work normally, is also not a fault but an internal tube flashover which occurs from time to time especially in new tubes.
If there is any continuous discharge or any overheating in the receiver however, it must be switched off at once and the fault traced.

18. Check that all three beams (Red, Green, and Blue) are producing a picture. Advance one or two of the A1 presets (convergence board) if necessary.

19. Set the focus control for the sharpest display.
Check the static convergence by examining the cross at the centre of the Test Card. Roughly register the three primary-colour pictures together by adjusting the four static convergence magnets on the scan coil assembly.

20. Loosen the wing-nuts and slide the scan coils as far forward as possible.

21. Turn the contrast to minimum. Switch off the green and blue beams. Advance the Brightness (and if necessary the Red A1 preset) for a reasonable level of screen illumination.

22. Observe that there is a roughly circular, pure red area on the screen. Adjust the two purity ring magnets until the red area is exactly at the centre.

23. With the set still switched on, and taking great care not to touch any of the live coil connections, slide the scan coils back until the red area fills the entire screen.
The screen should now be a perfectly uniform pure red. Any small errors can be corrected by slight adjustments to the purity magnets.
Tighten up the wing nuts again.

24. Switch on all beams, advance the contrast and check the static convergence again. Since this interacts with the purity adjustment, it may be necessary to repeat steps (19) to (23) until no further improvement is possible.

LUMINANCE CHANNEL ADJUSTMENTS (DECODER BOARD)

25. Reset the three A1 presets (convergence board) to minimum.

26. Remove the link from TP10 to TP11 and connect instead TP10 to TP9.

27. Connect the voltmeter on the 10V d.c. range between TP18 and TP19 (polarity not important).

28. Switch on, and after warm-up set RV11 for a zero reading on the meter (reducing the meter range for a fine adjustment).

29. Connect meter (10V d.c. range) from TP16 to TP17.

30. Adjust RV9 for a zero reading as before.

31. Connect meter (10V d.c. range) from TP14 to TP15.

32. Adjust RV10 for a zero reading as before. Remove the meter.

33. Using minimal room lighting (but with adequate lighting at the rear of the set for safety) advance the Red A1 preset on the convergence panel until a very faint red raster is visible.

34. Similarly advance the Green and Blue A1 controls for very faint screen illumination.

35. Switch off, remove the link from TP9 to TP10 and connect TP10 to TP11.

36. Set the Brightness and Contrast controls for the best monochrome picture.

37. Centre the picture on the screen horizontally using VR7 on the timebase board.

38. Check the picture width. Assuming the use of a 'squared-up' picture tube (eg. A56-120X, A66-120X) the Test Card should just slightly overlap the screen at each side. The castellations at each side should still be visible.
(a) If the width is correct, proceed to step (39).
(b) If the width is excessive, switch off and change the flying lead from R54 on the line output transformer from pin 9 to pin 8 of the transformer. Turn the line drive control fully clockwise (minimum EHT). Repeat step (17). Re-check the width.
(c) If the width is still excessive, switch off and change the flying lead from pin 8 on the line output transformer to pin 5. Turn the line drive control fully clockwise. Repeat step (17).

39. Switch off and remove the EHT meter.

40. Set the Line Linearity control L1 (Timebase Panel) for best uniformity in the width of the background squares on the Test Card. Re-adjust Line Shift if necessary.

41. Re-check picture width. If incorrect repeat step (38).

42. Connect Multimeter on the 25V d.c. range from the -ve end of C11 (Timebase board) to chassis.
Set VR4 (midpoint volts) for a reading of 20V. Remove meter.

43. Set Field Shift (convergence panel) to centre the picture. Set Height and Field Linearity (timebase panel) for best uniformity in the height of the background squares on the Test Card together with a truly round centre circle.

TABLE. 1.

Red and Green

Visual Effect	Ref.	Title	
Bowing vertical lines } bottom	RV6	R/G Amplitude	FIELD
} top	RV8	R/G Tilt	"
Separation of horizontal lines } top	RV7	R/G Difference	"
} overall	RV1	R/G Symmetry	"
Separation of vertical lines on left	RV12	R/G Amplitude	LINE
Separation of vertical lines on right	RV11	R/G Tilt	"
Bowing of horizontal lines, top & bottom	RV10	R/G Difference	"
Crossover of horizontal lines	L2	R/G Symmetry	"

TABLE. 2.

Blue and Yellow

Separation of horizontal lines } bottom	RV4	B Tilt	FIELD
} top	RV5	B Amplitude	"
Drooping blue horizontal lines	RV9	B Amplitude	LINE
Crossover of horizontal lines	RV13	B Tilt	"
Shape of blue horizontal lines	L5	B Shape	"

44. Connect a shorting link across the input to the Blue Lateral coil on the tube neck. Connect the crosshatch generator to the receiver. Set the Contrast and Brightness controls for a pattern of fairly low but usable contrast and with a black background. Check that the static (centre) registration of all three beams is approximately correct. Adjust the Focus carefully for the sharpest lines at the centre.

45. Switch off the blue beam. Adjust each red-green dynamic convergence control to register the red and green lines together to form yellow lines. Table 1 shows the type of convergence error which can be corrected with each control. It will be necessary to work through all steps in Table 1 several times until no further improvement is possible.
Keep a check on the static (centre) convergence throughout the procedure and reset the red and green static magnets as necessary.

46. Switch on the blue beam. Use Table 2 to register the blue lines with the yellow lines. Keep a check on the static convergence and reset the vertical and lateral blue static convergence magnets as necessary.

47. The overall shape of the picture will not be quite rectangular - the four edges will bow inwards in the middle giving the pincushion effect.
The Pincushion phase and Pincushion Amplitude controls should be adjusted to give a truly rectangular picture. The amplitude control affects all four sides while the Phase control affects the symmetry of the correction applied at the top and bottom.

48. Check the registration of Blue and Yellow vertical lines at the left and right hand sides.
Remove the short circuit from the blue lateral yoke coil and try to improve the registration using the blue lateral control L3 (convergence board).
Note the direction and amount of the correction which results.
(a) If the correction is in the wrong sense, switch off and reverse the connections to the blue lateral assembly.
(b) If the correction is in the right sense, but of wrong amplitude, switch off and change the link on the convergence board over to the other tap on L3.

49. Check the overall standard of convergence. It can never be quite perfect, but no serious errors should be visible on the crosshatch pattern at normal viewing distance. The complete convergence procedure from (44) to (49) should be repeated until no further improvement is possible.

50. Remove the crosshatch generator and restore the monochrome Test Card display.

51. Set the Brightness control and Contrast control for a normal monochrome picture. Check for any colour tint in the peak white areas of the picture. Vary the settings of RV12 (Red drive) and/or RV13 (Green drive) to obtain a neutral white.

52. Reduce the brightness setting slightly and check for any colour tint in the dark grey areas of the picture. If necessary, slightly reset <u>one</u> or <u>two</u> of the A1 voltage controls on the convergence panel to obtain neutral dark greys, leaving the third in its original position. Reset the Brightness to the normal position.

53. Switch off the tuner AFC at the push-button control unit. Offset the tuning of the button in use slightly so that a little sound-on-vision results.

54. Observe that there is a very fine pattern, which wriggles in time with the sound, all over the picture. It is more easily visible in the darker areas. This is the 6MHz intercarrier sound signal.
Screw the core slowly into the sound rejector L2 on the decoder board until the pattern is removed.

55. Reset the tuning to the normal position, ie just before sound on vision occurs.

56. Observe that there is a fine line pattern on some areas of the test card, particularly in the centre circle and on the colour bars at the top.
Screw the core slowly into the chroma rejector L1 on the decoder board until the pattern is minimised. It may help to reduce the Brightness setting somewhat, to make the pattern more visible.

57. Switch the set off. Remove the links from TP4 to chassis and from TP3 to TP4. Connect a link from TP7 to TP8. Connect the meter on the 10V d.c. range from TP6 to chassis (TP6 +ve). Set the saturation control to minimum.

58. Switch on and after warm-up set RV7 for a reading of 4.0 volts.

59. Connect the meter, still on the 10V d.c. range, to the output of the diode probe. Connect the input of the diode probe from TP5 to chassis.

60. Advance RV1 slowly to the setting corresponding to a peak in the meter reading.

61. There should now be some colour on the appropriate areas of the test card when the saturation control is advanced, but it will be flickering and rolling, i.e. unsynchronised.
Adjust C34 until the rolling of the colour is almost brought to a standstill.

62. Remove the link from TP7 to TP8. The colour should now lock although there may still be considerable patterning on it.

63. Set RV8 for a reading of 0.6 volts on the meter. Remove the meter and diode probe.

64. Remove the link from TP1 to TP2. This will cause a reduction in the saturation of the colours.

65. Observe that on the coloured areas of the picture there is a horizontal line pattern which appears to drift upwards. On closer examination this will be seen to be due to the fact that adjacent lines (or more correctly, adjacent pairs of lines) do not have quite the same colour on them. This is the 'Hanover bar' effect.
Reducing the Brightness and increasing the Saturation will make the pattern more easily visible.
Careful adjustment of L5 will enable the pattern to be almost entirely eliminated. Other types of patterning, for example on the vertical lines of the test card, or a grainy effect on the colour signal, may be observed. Do not pay **any** attention to these effects at this stage. They will be removed later.
It may be found that the setting of L5 which gives least Hanover bars on some screen areas is not quite optimum for other areas. Do not worry about this as the chroma delay line will later take care of this. Aim for least Hanover bars overall.

66. Replace the link from TP1 to TP2. This will cause an increase in saturation which can be corrected with the saturation control. It will also usually cause some Hanover bars to return. Set the Brightness and Saturation as before to make the bars as conspicuous as possible.

67. Adjust L4 carefully until the Hanover bars are removed. If, and only if, it is found impossible to completely remove the bars with L4, leave L4 in the best position and finish off by adjusting L7. In most cases however L7 will not need to be touched. (Great care is required with the core of L7).

68. Switch off and connect the 1nF capacitor from TP5 to the junction of L5 and R33 (i.e. across L5 and C30).

69. On switching on, there will be once again some Hanover bars on the screen. Careful adjustment of RV6 will enable them to be removed.

70. Remove the 1nF capacitor and connect a link between TP3 and TP4.

71. Remove the core from the 6MHz rejector L2 on the decoder board.

72. Turn the Saturation to maximum and check for the presence of a coarse bluish pattern which wriggles in time with the sound. This pattern will be all over the screen and is the 6MHz sound signal appearing in the colour channel.
Adjust the tuning very carefully until a point is found where the pattern is a minimum. This means that the sound carrier frequency corresponds to that of the sound rejector in the I.F. strip.

73. Switch on the AFC at the tuner control unit. Screw the core slowly into the AFC coil L3 on the I.F. panel. The tuning will be pulled away from the correct point at first, but as the core is screwed in, the tuning will again pass quite rapidly through the correct point, i.e. the point for minimum 6MHz patterning. Set the AFC coil accurately to the optimum tuning point.

74. Switch off the AFC and offset the tuning slightly so that the 6MHz pattern returns. Reset the 6MHz rejector L2 (decoder panel) to remove the 6MHz pattern on chroma. Correct the tuning again and switch on the AFC.

75. Turn the saturation to minimum. Remove the 680Ω damping resistor from the detector coil L2 on the I.F. board.
Check the vertical resolution on the Test Card, particularly where the grey background borders onto the white squares. Adjust the detector coil L2 (I.F. panel) for optimum resolution. This will normally mean a very slight black outline to the right of each vertical white line. The setting of L2 also influences the contrast, and the correct setting corresponds to a <u>minimum</u> in the contrast.

76. Disconnect one end of R21 (330Ω) on the decoder panel.

77. On switching on and advancing the saturation and brightness controls, a display of the colour-difference signals without the luminance signal will be seen. This is used to make a closer examination of the colour signal.
First examine the picture areas which have no colour signal on them and check for the presence of a course bluish pattern which wriggles about in sympathy with the sound. This pattern is caused by the presence of the 6MHz intercarrier sound signal in the chroma channel. If necessary, slightly reset the sound rejector L2 (decoder panel) to remove the pattern.

78. Now examine the picture where the vertical lines would be on the luminance image, if it were present, e.g. on the grid of background squares, the 'noughts and crosses' at the centre, etc. An interference pattern will be present, drifting downwards. It will be found possible by adjusting the chroma filter coil L3 to reduce this interference to a minimum although it is not possible in any receiver to eliminate it entirely. Since L3 tunes quite broadly, it may help to turn the core quite rapidly to start with.

79. Now finally reconnect R21 (330Ω).

80. Establish the correct saturation setting as follows. Set the saturation to minimum and the Contrast and Brightness for a normal monochrome picture. We now need to use the standard colour bar signal, which is sometimes transmitted over the whole screen. However, it is also available at the extreme top of the Test Card. It may be necessary to shift the picture down a little in order to see all of the bars.
In monochrome, the colour bars appear as a grey scale with decreasing brightness from left to right. Switch off the Green and Blue beams using the switches on the convergence panel.
On advancing the saturation control, the colour bars will become - from left to right - two adjacent red bars followed by two dark bars, then a second pair of red bars, and a second pair of dark bars.
Set the Saturation control so that the two pairs of red bars have equal brightness, reducing the Brightness setting for a fine adjustment.

81. Switch on the Green and Blue beams and set the Brightness to its normal position.

82. Check the skin tone on the Test Card and reset RV12 and/or RV13 if necessary to obtain the most natural colour. If any adjustment is made, re-check step (52).

83. Set the Brightness and Contrast controls for a normal picture. Remove the Red cathode lead from the decoder panel (pin R). Set meter to the 10mA d.c. range and connect the +ve lead to the Red cathode and the negative lead to pin R. Switch off the Green and Blue beams. Set the Beam limiter control fully anticlockwise. Set the Contrast to maximum. Set the beam limiter control for the following current:

Tube Size	Current (mA)
20	1.0
22	1.3
26	1.5

Restore the normal connection to the Red cathode. Reset the contrast to normal.

SOUND CHANNEL ALIGNMENT

84. Connect the meter on the 10V d.c. range across C28 on the I.F. panel.

85. Adjust L6 to obtain a zero reading, which should correspond to the position giving clearest sound.

86. Switch off the AFC and de-tune the button anticlockwise until the sound is noisy but still audible.
Adjust L4 and L5 for minimum background noise.
Reset the tuning to normal.
This completes the alignment procedure.

PARTS LIST:

I.F. KIT.

CIRCUIT REF.	VALUE IN OHMS	RATING	TOLERANCE AND TYPE	FITTING CHECK
R1	100	.33W	5% Carbon Film	
R2	1K	"	" " "	
R3	330	"	" " "	
R4	1.5K	"	" " "	
R5	1.5M	"	" " "	
R6	47K	"	" " "	
R7	270K	"	" " "	
R8	68K	"	" " "	
R9	22K	1W	" " "	
R10	47	.33W	" " "	
R11	3.3K	"	" " "	
R12	2.2K	"	" " "	
R13	3.3K	"	" " "	
R14	18K	"	" " "	
R15	4.7K	"	" " "	
R16	47K	"	" " "	
R17	270	1W	" " "	
R18	470	"	" " "	
R19	1K	.33W	" " "	
R20	1	"	" " "	
R21	2.2	"	" " "	
R22	8.2	1W	10% Carbon	
RV1	10K	.2W	Pre-Set A.G.C. Delay	
RV2	47K	Log Spindle Potentiometer	Volume Control *	
C1	6.8pF	63v	Ceramic Plate	
C2	100nF	250v	C280	
C3	5.6pF	63v	Ceramic Plate	
C4	2n2	"	"	
C5	150µF	16v	Electolytic	
C6	56p	63v	Ceramic Plate	Part of L2
C7	0.6pF		Ceramicon	
C8	0.6pF		"	
C9	2n2		Ceramic	
C10	47p	63v	Ceramic Plate	Part of L3
C11	150µF	16v	Electrolytic	
C12	47n	250v	C280	
C13	22n	"	"	
C14	4.7p	63v	Ceramic Plate	
C15	180p	"	" "	Part of L4
C16	150p	"	" "	
C17	180p	"	" "	Part of L5
C18	8.2p	"	" "	
C19	2n2	"	Ceramic	
C20	150µF	16v	Electrolytic	
C21	100n	250v	C280	
C22	100n	"	"	
C23	100n	"	"	
C24	22p	63v	Ceramic Plate	
C25	1000pF	125v	Polystyrene	
C26	22p	63v	Ceramic Plate	
C27	2.2µF	63v	Electrolytic	
C28	10n	250v	C280	
C29	100n	"	"	
C30	10µF	25v	Electrolytic	
C31	150µF	6.3v	"	
C32	100µF	6.4v	"	
C33	470µF	6.3v	"	
C34	250µF	25v	"	

* Part of control kit.

CIRCUIT REF.	DESCRIPTION	FITTING CHECK
L1	Choke	
L2	Tank Tuning	
L3	AFC "	
L4	Sound Input	
L5	"	
L6	" Quad.	
IC1	TCA270Q	
IC2	TAA550b	
IC3	TBA750Q	
TR1	BD131	
TR2	BD131	
1	ELC1043/06 Varicap Tuner	
1	400/G Pre-Aligned IF Module	
1	Printed Circuit Panel Type 400	
2	Heat Sinks Etc. for TR1 & TR2	
2	Pins for Z1 & Z2	
S1	10 Way Socket	
S2	6 " "	

CONTROLS

CONTROL UNIT ASSEMBLIES

Note: RV1 and 2RV3 - 5 are included below and are not in the I.F. or decoder kits, also 2R16, 2R35, 2R35A, & 2C4.

RV1 Volume control with mains switch	50K log.
2RV3 Contrast	10K lin.
2RV4 Saturation	10K lin.
2RV5 Brightness	1K lin.
Varicap control unit type 4142	
2R16	1K
2R35	820Ω
2R35A	820Ω
2C4	15μF

	CIRCUIT REF.	VALUE IN OHMS	RATING	TOLERANCE AND TYPE	FITTING CHECK
DECODER	2R1	15K	.3W	5% Carbon Film	
	2R2	4.7K	"	" " "	
	2R3	22K	"	" " "	
	2R4	8.2K	"	" " "	
	2R5	2.2K	"	" " "	
	2R6	270	"	" " "	
	2R7	100	"	" " "	
	2R8	82	"	" " "	
	2R9	6.8K	"	" " "	
	2R10	12K	"	" " "	
	2R11	10	.5W	" " "	
	2R12	1K	.3W	" " "	
	2R13	10K	"	" " "	
	2R14	1.5K	"	" " "	
	2R15	22K	"	" " "	
	2R16	1K	.5W	" " "	**Part of control kit
	2R17	1K	.3W	" " "	
	2R18	8.2K	"	" " "	
	2R19	2.2K	"	" " "	
	2R20	12K	"	" " "	
	2R21	330	"	" " "	
	2R22	560	"	" " "	
	2R23	1.5K	"	" " "	
	2R24	1.2K			
	2R25	1.5K	"	" " "	
	2R26	1K	"	" " "	
	2R27	470	"	" " "	
	2R28	470	"	" " "	
	2R29	18K	"	" " "	
	2R30	27K	"	" " "	
	2R31	15K	"	" " "	
	2R32	220K	"	" " "	
	2R33	1K	"	" " "	
	2R34	10K	"	" " "	
	2R35	820	.5W	" " "	2R35A 820Ω .5W **
	2R36	1K	.3W	" " "	
	2R37	5.6K	"	" " "	
	2R38	390	"	" " "	
	2R39	3.9K	"	" " "	
	2R40	1.5K	"	" " "	
	2R41	12K	"	" " "	
	2R42	150	"	" " "	
	2R43	1.2K	"	" " "	
	2R44	470	"	" " "	
	2R45	1.8K	"	" " "	
	2R46	27K	"	" " "	
	2R47	27K	"	" " "	
	2R48	220	"	" " "	
	2R49	10K	.5W	2% " "	
	2R50	10K	.5W	2% " "	
	2R51	270	.3W	5% " "	
	2R52	1K	"	" " "	
	2R53	1K	"	" " "	
	2R54	10K	"	" " "	
	2R55	330	"	" " "	
	2R56	220	"	" " "	
	2R57	1.5K	"	" " "	
	2R58	5.6K	"	" " "	
	2R59	5.6K	"	" " "	
	2R60	5.6K	"	" " "	
	2R61	1K	"	" " "	
	2R62	150	"	" " "	

REF.	IN OHMS		AND TYPE	CHECK
2R63	3.9K	.3W	5% Carbon Film	
2R64	47	"	" " "	
2R65	1.5K	"	" " "	
2R66	82	"	" " "	
2R67	1.5K	"	" " "	
2R68	82	"	" " "	
2R69	27	"	" " "	
2R70	1K	"	" " "	
2R71		Part of	Thick Film Unit	
2R72	10K	.3W	5% Carbon Film	
2R73	1.2K	"	" " "	
2R74	47	1W	" " "	
2R75		Part of	Thick Film Unit	
2R76	1.5K	1W	10% Carbon	
2R77	47K	1W	10% "	
2R78	1.5K	.3W	5% Carbon Film	
2R79	82	.3W	" " "	
2R80	1.5K	"	" " "	
2R81	82	"	" " "	
2R82	27	"	" " "	
2R83	1K	"	" " "	
2R84		Part of	Thick Film Unit	
2R85	10K	.3W	5% Carbon Film	
2R86	1.2K	"	" " "	
2R87		Part of	Thick Film Unit	
2R88	1.5K	1W	10% Carbon	
2R89	47K	1W	10% "	
2R90	1.5K	.3W	5% Carbon Film	
2R91	82	"	" " "	
2R92	1.5K	"	" " "	
2R93	1.5K	"	" " "	
2R94	82	"	" " "	
2R95	27	"	" " "	
2R96	1K	"	" " "	
2R97		Part of	Thick Film Unit	
2R98	10K	.3W	5% Carbon Film	
2R99	1.2K	"	" " "	
2R100		Part of	Thick Film Unit	
2R101	1.5K	1W	10% Carbon	
2R102	47K	1W	" "	

CIRCUIT REF.	VALUE	VOLTAGE	TYPE
2C1	100n	250v	C280
2C2	100n	250v	C280
2C3	6.8n	100v	Ceramic
2C4	15µF	40v	Electrolytic * with control kit
2C5	47p	63v	Plate } Part of 2L1
2C6	47p	63v	Ceramic } Part of 2L1
2C7	470p	150v	Polystyrene
2C8	100n	250v	C280
2C9	47n	"	"
2C10	47n	"	"
2C11	68µF	16v	Electrolytic
2C12	100n	250	C280
2C13	47p	63v	Ceramic
2C14	330p	63v	Ceramic Plate } Part of 2L2
2C15	330p	"	" " } Part of 2L2
2C16	15p	"	" "
2C17	56p	"	" "
2C18	120p	"	" " } Part of 2L3
2C19	120p	"	" " } Part of 2L3

CIRCUIT REF.	VALUE	VOLTAGE	TYPE	FITTING CHECK
2C20	100n	250v	C280	
2C21	100n	"	"	
2C22	150µF	16v	Electrolytic	
2C23	1.5µF	63v	"	
2C24	10µF	25v	"	
2C25	10µF	25v	"	
2C26	10n	250v	C280	
2C27	120p	63v	Ceramic Plate	
2C28	33p	"	" "	
2C29	10n	250v	C280	
2C30	220p	63v	Ceramic Plate	Part of 2L5
2C31	33p	"	" "	
2C32	100n	250v	C280	
2C33	18p	63v	Ceramic Plate	
2C34	4-60p	100v	Trimmer	
2C35	82p	63v	Ceramic Plate	
2C36	100n	250v	C280	
2C37	22p	63v	Ceramic Plate	
2C38	2.2µF	63v	Electrolytic	
2C39	15µF	40v	"	
2C40	330n	250v	C280	
2C41	330n	250v	C280	
2C42	100n	250v	C280	
2C43	10n	250v	C280	
2C44	10n	250v	C280	
2C45	10n	250v	C280	
2C46	330n	250v	C280	
2C47	100n	250v	C280	
2C48	27p	63v	Ceramic Plate	
2C49	27p	"	" "	
2C50	27p	"	" "	
2C51	10p	"	" "	
2C52	10p	"	" "	
2C53	10p	"	" "	
2C54	4.7n	100v	Ceramic	
2C55	100n	250v	C280	
2C56	330p	63v	Ceramic Plate	
2C57	330p	"	" "	
2C58	330p	"	" "	
2C59	2.2n	100v	Ceramic	
2C60	2.2n	"	"	
2C61	2.2n	"	"	
2C62	10n	250v	C280	
2C63	10n	"	"	
2C64	10n	"	"	
2C65	3.3p	63v	Ceramic Plate	
2C66	3.3p	"	" "	
2C67	3.3p	"	" "	
2C68	100n	250v	C280	
2RV1	500		.2w Pre Set	
2RV2	1K		" " "	
2RV3	10K		Front Panel	Part of control kit
2RV4	10K		" "	
2RV5	1K		" "	
2RV6	500		.2w Pre Set	
2RV7	50K		" " "	
2RV8	5K		" " "	
2RV9	2.5K		" " "	
2RV10	2.5K		" " "	
2RV11	2.5K		" " "	
2RV12	2.5K		" " "	
2RV13	2.5K		" " "	

CIRCUIT REF.	DESCRIPTION	FITTING CHECK
2IC1	TBA 560CQ	
2IC2	TBA 540Q	
2IC3	TBA 990Q	
2IC4	TBA 530Q	
2.XTAL	4.433618.75 hz Sub-Carrier Crystal	
2TR1	BC 148	
2TR2	BC 148	
2TR3	BC 148	
2TR4	BF 337	
2TR5	BF 337 With fitting pads	
2TR6	BF 337	
2D1	1N4148	
2DL	DL50 or TAU40 Chrominance Delay Line	
2LD	DL102 Luminance Delay Line	
2L1		
2L2		
2L3		
2L4		
2L5		
2L6	Ferroxcube transformer	
2L7	AT4044/01	
2S1	10 way socket	
2S2	6 " "	
TP1 etc.	PC test point pins	
	3 Heatsinks	
	P.C. Panel Type 420	

SUNDRIES

SUNDRIES PACK

2 - 1n Ceramics
2 - OA91 Diodes
1 - 680Ω
1 - 10n C280 capacitor
1 - Packet of core locking compound
1 - " " Heatsink "
1 - Trimming tool.

	CIRCUIT REF.	VALUE IN OHMS	RATING	TOLERANCE AND TYPE	FITTING CHECK
TIMEBASE	3R1	47K	.5W	5% Carbon Film	
	3R2	3.9K	"	" " "	
	3R3	10K	"	" " "	
	3R4	10K	"	" " "	
	3R5	3.3K	"	" " "	
	3R6	680Ω	"	" " "	
	3R7	22K	"	" " "	
	3R8	220Ω	"	" " "	
	3R9	470K	"	" " "	
	3R10	10K	"	" " "	
	3R11	470K	"	" " "	
	3R12	18K	"	" " "	
	3R13	22	"	" " "	
	3R14	1K	2.5W	10% Wire Wound	
	3R15	220	.5W	5% Carbon Film	
	3R16	560	"	" " "	
	3R17	220	"	" " "	
	3R18	15Ω	"	" " "	
	3R19	47Ω	"	" " "	
	3R20	2.7Ω	2.5W	10% Wire Wound	
	3R21	5.6Ω	"	" " "	
	3R22	3.3Ω	"	" " "	
	3R23	VA1034	Thermistor		
	3R24	330K	.33W	5% Carbon Film	
	3R25	1.5K	"	" " "	
	3R26	330Ω	"	" " "	
	3R27	1.5M	"	" " "	
	3R28	2.2K	"	" " "	
	3R29	1K	"	" " "	
	3R30	82K	"	" " "	
	3R31	1.2K	"	" " "	
	3R32	2.2K	"	" " "	
	3R33	22K	"	" " "	
	3R34	330Ω	.33W	" " "	
	3R35	47K	.5W	" " "	
	3R36	33K	.33W	" " "	
	3R37	15K	"	" " "	
	3R38	220Ω	"	" " "	
	3R39	2.7K	.5W	2% Metal Film	
	3R40	15K	.33W	5% Carbon Film	
	3R41	27K	"	" " "	
	3R42	10Ω	.5W	" " "	
	3R43	470Ω	"	" " "	
	3R44	82K	"	" " "	
	3R45	47K	"	" " "	
	3R46	3.3M	"	" " "	
	3R47	2 x 820K	"	" " "	
	3R48	330K	"	" " "	
	3R49	2.7K	7W	Wire Wound 10%	
	3R50	1K	.5W	5% Carbon Film	
	3R51	10Ω	1W	" " "	
	3R52	1.8K	5W	10% Metal Film	
	3R53	82K	.5W	5% Carbon Film	
	3R54	470Ω	1W	10% Carbon	
	3R55	1.5K	3W	Wire Wound 10%	

CIRCUIT REF.	VALUE	VOLTAGE	DESCRIPTION	FITTING CHECK
3C1	22n	250v	C280	
3C2	4.7µF	30v	Electrolitic	
3C3	100n	250v	C280	
3C4	56p	63v	Ceramic Plate	
3C5	50µF	50v		
3C6	220n	250v	C280	
3C7	50µF	50v	Electrolitic	
3C8	25µF	25v	"	
3C9	47n	250v	C280	
3C10	2.2µF	"	"	
3C11	250µF	40v	Electrolitic	
3C12	330p	63v	Ceramic Plate	
3C13	.68µF	250	C280	
3C14	100n	250	"	
3C15	22n	"	"	
3C16	220p	63v	Ceramic Plate	
3C17	82p	"	" "	
3C18	220n	250v	C280	
3C19	100p	63v	Ceramic Plate	
3C20	4.7µF	30v	Electrolitic	
3C21	33n	250v	C280	
3C22	10n	"	"	
3C23	10,000µF	125v 5%	Polystyrene	
3C24	10n	250v	C280	
3C25	80µF	16v	Electrolitic	
3C26	47n	250v	C280	
3C27	330n	400v	C280	
3C28	1n	250v	Foil	
3C29	.01µF	400v	"	
3C30	220p	8Kv	Hi Voltage Disc. Ceramic	
3C31	100n	400v	Foil	
3C32	.015µF	"	"	
3C33	180p	8Kv	Hi Voltage Disc. Ceramic	
3C34	.47µF	1000v	Blue-Con.	
3C35	330p	6Kv	Hi Voltage Disc. Ceramic	
3C36	150µF	16v	Electrolitic	
3C37	47p	250v	Silver Mica	
3C38	.047µF	1000v	MDC (may be .1µF 1000v)	
3C39	.68µF	200v AC	4 AMP	
3C40	220µF	16v	Electrolitic	
3VR1	470		.5W Pre Set	
3VR2	22K		" " "	
3VR3	470		" " "	
3VR4	470		" " "	
3VR5	10K		.2W " "	
3VR6	4.7M		.5W " "	
3VR7	100		3W Centre Tap	
3VDR	E298/ZZ06	Voltage Dependent Resistor		
3V1	PY500A		Valve	
3V2	PL509		"	
3L1	AT4042/02		Linearity Control	
3L2	CCF800		Centre Choke	

CIRCUIT REF.	TYPE	DESCRIPTION	FITTING CHECK
3T1	AT2055/00	Line Output Transformer	
EHT Tripler	TS25.11.TAY	Tripler Assembly (or LP1174/35)	
Focus Unit		Thick Film Assembly	
3IC1	TBA920Q	Line Osc. Combination	
3TR1	MPS6566 (BC147)	Transistor	
3TR2	BC148	"	
3TR3	AC128	"	
3TR4	BD131	"	
3TR5	BD131	"	
3TR6	40321 (BF355)	"	
3DS1	BR101	"	
3D1	1N914	Diode	
3D2	BA154	"	
3D3	BY206	"	
3D4	"	"	
3D5	"	"	
3S1		10 Way Socket	
3S2		4 " "	

QUANTITY	DESCRIPTION
1	Printed Circuit Panel Type 430
2	Heat Sinks etc. for 3TR4 & 3TR5
2	B9D Valve Bases (Ceramic)
2	Valve Top Cap Assemblies
1	Fuse Holder
2	Fuses
4	Rubber Grommets
4	Medium 4BA Bolts
2	Short 4BA Bolts
4	4BA Washes
6	4BA Nuts
3	Transistor Pads for 3TR3, 3TR6, & 3DS1
4	PC Test Point Pins

DEGAUSING & SHIELD

CRT Shield and Degaussing Assembly

Sizes available are 19", 20", 22", and 26"

1 - Pair of Degaussing Coils
1 - Metal Shield
4 - Mounting Feet
2 - Tag Strips
2 - Earthing Springs
2 - Push-On Connectors
2 - 4 BA Nuts & Bolts

We have a CRT front panel cut-out diagram available on request.

	CIRCUIT REF.	VALUE IN OHMS	RATING	TOLERANCE AND TYPE	FITTING CHECK
CONVERGENCE	4R1	330	1W	10% Wirewound	
	4R2	390	1W	" "	
	4R3	3.3	2W	" "	
	4R4	4.7	2W	" "	
	4R5	2.2	4W	" "	
	4R6	8.2	2W	" "	
	4R7	1.5	2W	" "	
	4R8	120	4W	" "	
	4R9	1 M	.5W	5% Carbon Film	
	4R10	See Text			
	4RV1	5	3W	Pre-Set Wirewound	
	4RV2	15	"	" " "	
	4RV3	1K	"	" " "	
	4RV4	500	"	" " "	
	4RV5	20	"	" " "	
	4RV6	7	"	" " "	
	4RV7	200	"	" " "	
	4RV8	5	"	" " "	
	4RV9	10	"	" " "	
	4RV10	10	"	" " "	
	4RV11	5	"	" " "	
	4RV12	7	"	" " "	
	4RV13	10	"	" " "	
	4RV14	2.2M	.5W	Hi Voltage Pre-Set	
	4RV15	"	"	" " " "	
	4RV16	"	"	" " " "	
	4D1 @ 4D2	=	=	AC128 or NKT279T.	
	4C1	47n	250v	C280	
	4C2	400µF	40v	Electrolytic	
	4C3	15µF	63v	Reversible Electrolytic	
	4C4	150µF	25v	Electrolytic	
	4C5	100n	250v	C280	
	4C6	1µF	"	"	
	4C7	470n	"	"	
	4L1	AT4040/50		Pincushion Phase	
	4L2	AT4040/77		R/G Symmetry	
	4L3	AT4040/75		Blue Lateral	
	4L4	RG180		R.G. Tilt Choke	
	4L5	AT4040/75		Blue Shape	
	4SW1	Slide Switch		CRT Gun Switch	
	4SW2	" "		" " "	
	4SW3	" "		" " "	
	4T1	AT4041/37		Transductor	
	1	Control Diagram for top panel.			
	1	Printed Circuit Panel Type 440			
	1	" " " " 441			
	4	**Nylon spacer pillars with bolts**			
SCAN KIT	1	Scan Yoke Assembly			
	1	Convergence Purity Assembly			
	1	Blue Lateral Magnet Unit			

	CIRCUIT REF.	VALUE IN OHMS	RATING	TOLERANCE AND TYPE	FITTING CHECK
C.R.T. BASE	5R1	100K	½W	5% Carbon Film	
	5R2	100K	"	" " "	
	5R3	100K	"	" " "	
	5R4	1K	"	" " "	
	5R5	1K	"	" " "	
	5R6	1K	"	" " "	
	5R7	8.2K	"	" " "	
	5R8	8.2K	"	" " "	
	5R9	8.2K	"	" " "	
	5R10			Not required	
	5R11	470K	1W	5% Carbon Film	
	5C1	.01	1400v	Ceramic	
	5C2	.01	"	"	
	5C3	.01	"	"	
	5C4	NOT USED			
	SG1 - SG11	1.5kv		Spark Gaps	
	SG12	6.7kv		" "	
	1	Printed Circuit Panel Type 450			
	10	PC Connection pins			
	2	4BA Nuts & Bolts			
	3	4BA Solder Tags			
	1	B14G Base			

WIRE & PLUGS

P1	and 2	10 way and 6 way
2P1	and 2	10 way and 6 way
3P1	and 2	10 way and 4 way

Wire harness

Wires for short leads and focus cable

Mains lead

Aerial Socket Assembly

Red, Green, & Blue webbed cable for RGB leads

POWER UNIT

CIRCUIT REF.	VALUE IN OHMS	RATING	TOLERANCE AND TYPE	FITTING CHECK
6R1	470Ω	3W	wire or metal film	
6R2	98003		Thermistor	
6R3	VA1104		"	
6R4	10	10W	Wirewound	
6R5	27	"	"	
6R6	1·8K	10W	"	
6R7	8.2	"	"	
6R8	1.5	5W	if required	
6R9	6.8K	.5W	Carbon Film	
6R10	8.2K	"	" "	
6R11	200	2.5W	Wirewound	
6R12	27K	.5W	Carbon Film	
6R13	2.2K	.5W	Pre-Set	
6R14	8.2K	.5W	Carbon Film	
6R15	100K	.5W	" "	
6R16	100K	.5W	" "	
6C1	.01	1400v	Ceramic	
6C2	400µF	350v	Electrolytic	
6C3	400µF			
6C4	100µF	300v	"	
6C5	2500µF	40v	" (3300)	
6C6	2200µF	35v	"	
6C7	330n	250v	C280	
6C8	2500µF	63v	Electrolytic (2200)	
6C9	10n	250	C280	
6C10	1µF	"	"	
6C11	10n	"	"	
6C12	100µF	50v	Electrolytic	
6C13	100n	250v	C280	
6C14	100n	"	"	
6IC1	L036 or MC7812	12v	Regulator	
6TR1	2N3055		Transistor	
6TR2	2N3053		"	
6TR3	BC147		"	
6D1	BY127		Diode	
6D2	"		"	
6D3	"		"	
6D4	"		"	
6D5	SKB1.2		Bridge Rectifier	
6D6	"		" "	
6D7		10v	Zener Diode	
6F1	3.15A	Anti Surge Fuses		
6F2	800MA	" " "		
6F3	1A	" " "		
6F4	1.25A	" " "		
6T1	Mains Transformer			

1	Printed Circuit Panel Type 460
1	Metal Chassis Plate
6	2BA Bolts, Nuts, & Washes
4	Capacitor Clips with nuts & bolts
4	20mm PC Fuse Holders
1	Heatsink for IC1 & TR1
2	Stand-off pillars with nuts & bolts