electronics tod

DECEMBER 1977 international

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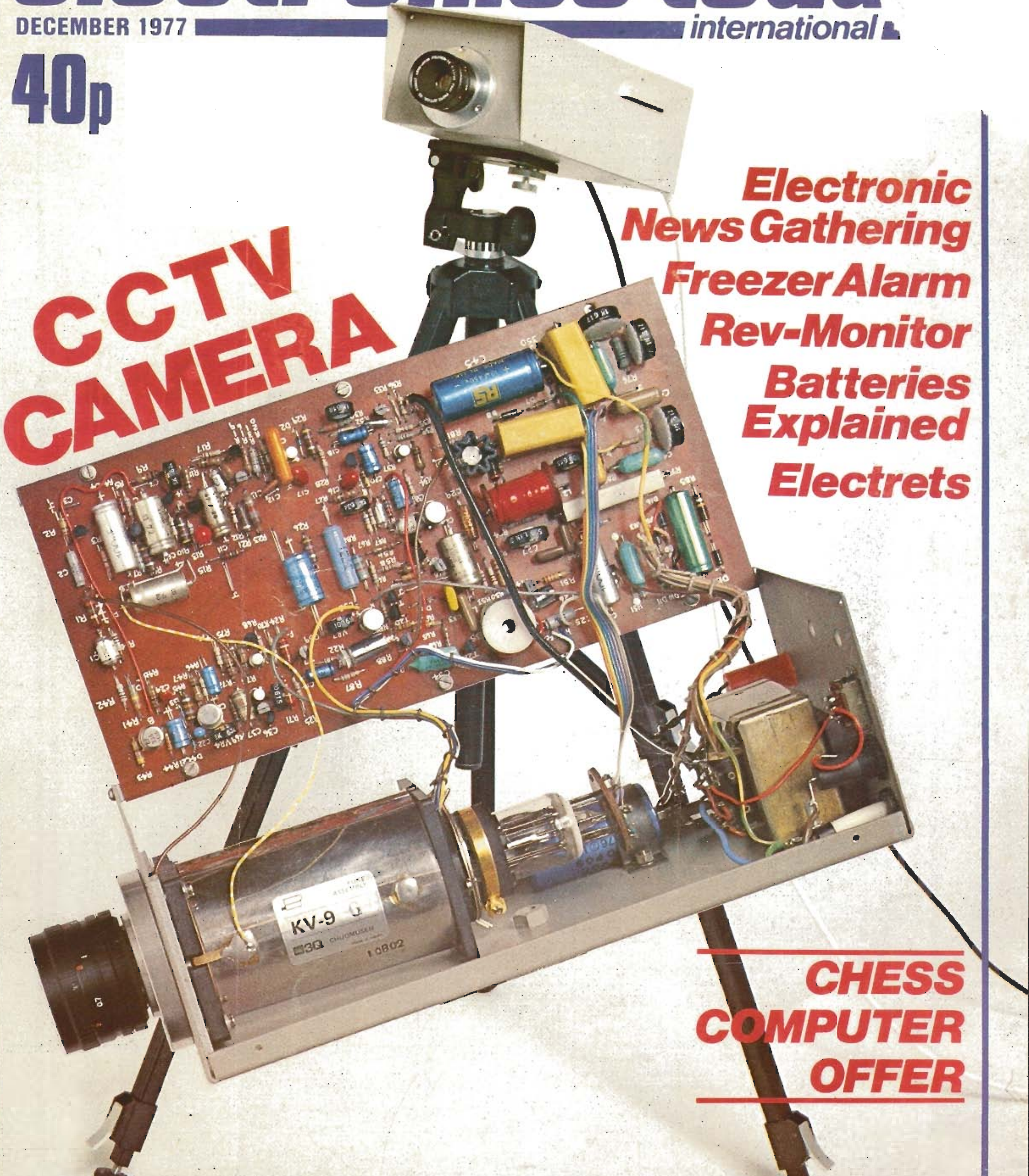
CCTV CAMERA



Electronic News Gathering

Freezer Alarm

Rev-Monitor

Batteries Explained

Electrets

CHESS COMPUTER OFFER

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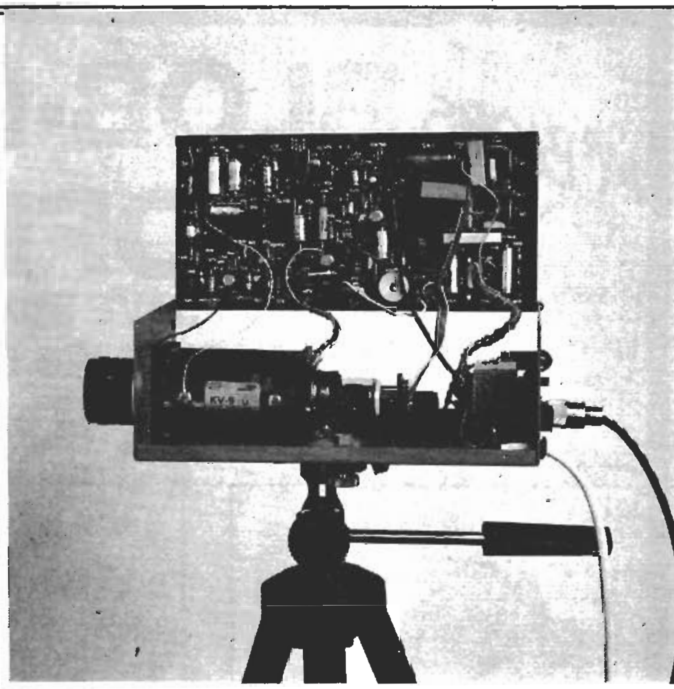
This month we present a low cost, high quality design from Crofton Electronics for a

CCTV CAMERA



UNTIL RECENTLY THE appeal of a CCTV camera was limited to a large extent by two factors.

The first being that the only video recorders available were very expensive professional, or semi-professional, machines that were beyond the reach of all but the most affluent of amateurs. This situation was a severe drawback as far as many potential users were concerned because, in most applications, some means of preserving a record of the camera's output is an essential part of the appeal of a CCTV system

Attitude Of Mind

The second reason that CCTV cameras have not been more popular in the past can be attributed to an attitude of mind. Thus, until now most people have viewed their TV set, in both the literal and mental sense, as merely a means of receiving picture and sound signals pumped out by the TV stations under the guise of entertainment.

Today, however, people are beginning to recognise the vast number of additional uses to which "The Box" can be put. TV Games, Teletext and Viewdata have shown just what a versatile creature the TV set is.

The realization of the TV's potential coupled with today's crop of low-cost video recorders, means that a CCTV camera should have a far wider appeal today than would have been the case a few years ago.

Before we move on to describe the design and construction of the camera in detail we shall briefly explain just how a TV picture is produced.

Picture Parlance

The picture is formed by arranging for an electron beam to scan the phosphor coated inside surface of a TV tube in a series of horizontal lines.

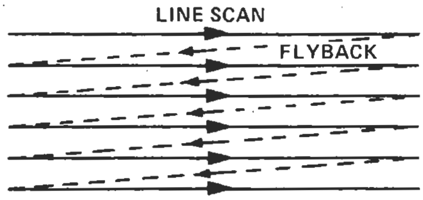
The electron beam upon striking the screen causes the phosphor to emit light from the screen's surface — the amount of light emitted depending upon the electron beam current at that instant, which in turn will depend upon the video signal level.

The scanning action referred to above starts at the top left-hand corner of the screen. Each scan line then moves across the screen from left to right and slants slightly downwards towards the right. At the end of a line the beam returns rapidly to the left-hand side of the screen. This action is called line flyback.

When the screen has been scanned in this manner the beam is positioned at the bottom right-hand side of the screen. From here it is returned rapidly to its starting position — the action of frame flyback.

In order that the human eye perceives the resultant display as a continuous, flicker free, picture, it is necessary for fifty complete scans of the screen to take place every second.

Fig. 1. Diagramatic representation of the scanning action of a TV set.



HOW IT WORKS

In essence the vidicon comprises a light sensitive element and an electron gun housed in an evacuated glass tube.

Light from the scene to be televised is imaged onto the Vidicon's photoconductive target by the camera's lens. The function of the Vidicon is to convert this image into an electrical signal suitable for processing by the camera electronics.

The construction of a typical vidicon can be seen in Fig 2.

The light sensitive element is comprised of a transparent conductive coating deposited on the inner surface of the tube faceplate. This layer is coated with a thin film of photo-conductive material.

An external target ring is fitted to the outer edge of the face plate and is connected to one side of the photo-conductive coating via the transparent conductive layer.

The other side of the photo-conductive layer is scanned by a low velocity electron beam.

The photo-conductive layer may be regarded as being composed of many discrete capacitors each one insulated from its neighbour, but each having one of its plates connected to the target ring via the conductive coating. The other plate of each capacitor is left floating.

With the target connected to a positive potential, the electron beam is made to scan all the floating capacitors. This initiates electron flow that charges up all of the individual capacitors.

Due to the photo-conductive properties of these capacitors, their individual

With a 625-line standard, if we were to produce fifty 625-line pictures every second the bandwidth required in the video amplifier stages would be of the order of 12 MHz.

In order to reduce the bandwidth requirements to a more manageable level a system of interlaced scanning is used.

In this system the whole picture is covered by only half the number of lines. Thus in the 625-line system two 'frames' of 312.5 lines make up one complete 625-line 'field' every 1/25 second. This effectively halves the bandwidth requirement while still providing high definition, flicker-free, pictures.

Camera Conventions

The TV camera uses a similar system of scanning, except that in this case the TV screen's phosphor layer is replaced by a photo sensitive layer onto which the scene to be televised has been focused.

In order to ensure that the picture produced on the TV screen is "intelligent" it is necessary to ensure that the scanning action of the camera and TV set are in step —or in sync (synchronisation).

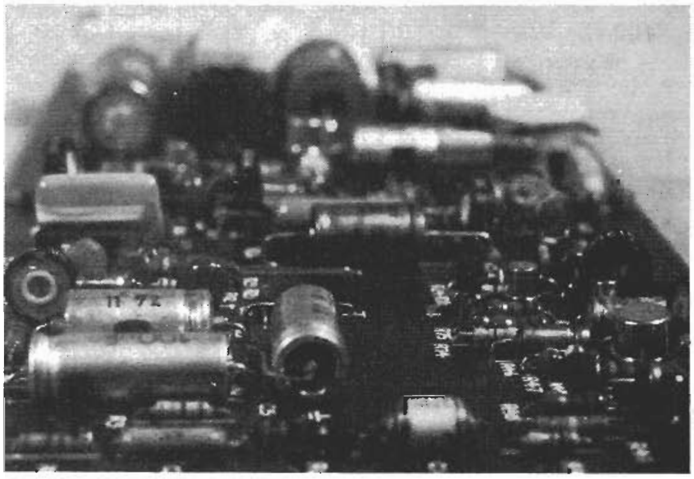
To achieve this, sync pulses are added to the video signal at the camera and used in the TV set to synchronise scanning action.

Two types of sync pulses are required. First, line sync pulses which occur at the end of every line and second, frame pulses to indicate the end of a frame.

The TV camera also produces signals that ensure that the TV's display is blanked (turned off) during the line and frame flyback periods.

Oh So Discrete

A look at the circuit diagram will reveal a cornucopia of transistors and diodes with a famine of ICs. This may prompt some of you to ask why we did not make more use of ICs in the video stages, and perhaps in the line and field sections.



The reasons for not using ICs in these stages are that the camera would have been no cheaper, no more reliable, more expensive to repair if things went wrong and probably would never have been finished as most of the ICs would probably have been very difficult to get hold of.

We think our discrete design was the best bet.

In Camera

Construction of the camera is simplified by the fact that most of the components are mounted on a single PCB.

Mount the components on this board according to the overlay shown in Fig 6. Pay particular attention to the orientation of all polarized capacitors and consult the semiconductor lead-outs shown before soldering these devices in place.

Note that the junction of R11 and Q4's base should be formed by cropping Q4's base as close to the case of this device as is possible and soldering R11 directly to the cropped lead.

Note also that diode D11 is a temperature compensating device and should be mounted in close proximity to Q28.

The board is of compact design as can be seen from our photographs and care should be taken to ensure that a neat, well finished, board is produced.

C44 is not mounted on the PCB and should be clamped to the

THE VIDICON

discharge times will depend upon their illumination which determines their internal resistance. The greater the illumination, the lower the internal resistance and the faster the discharge time.

Each subsequent scanning of the capacitors will restore the individual charge to maximum, the amount of charge required to do so being directly related to the illumination of the cell between scan times.

This varying signal, as the electron scans all the capacitors, is sampled across a load and used as the video signal.

The electron beam is generated by the vidicon electron gun (comprising cathode, control grid and anode1). It is focused into a fine spot on the rear surface of the target in order to perform the action described above.

The mesh anode is a fine wire mesh placed closely to and parallel with the photo-sensitive layer, to slow the electron beam down (it is connected to a positive potential).

This reduces secondary emission and improves resolution.

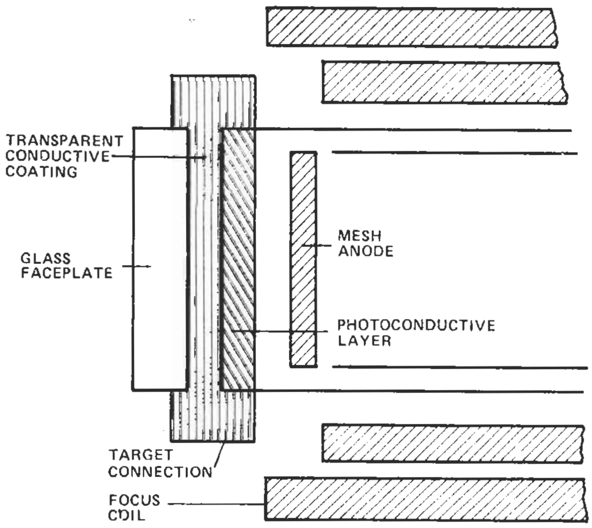
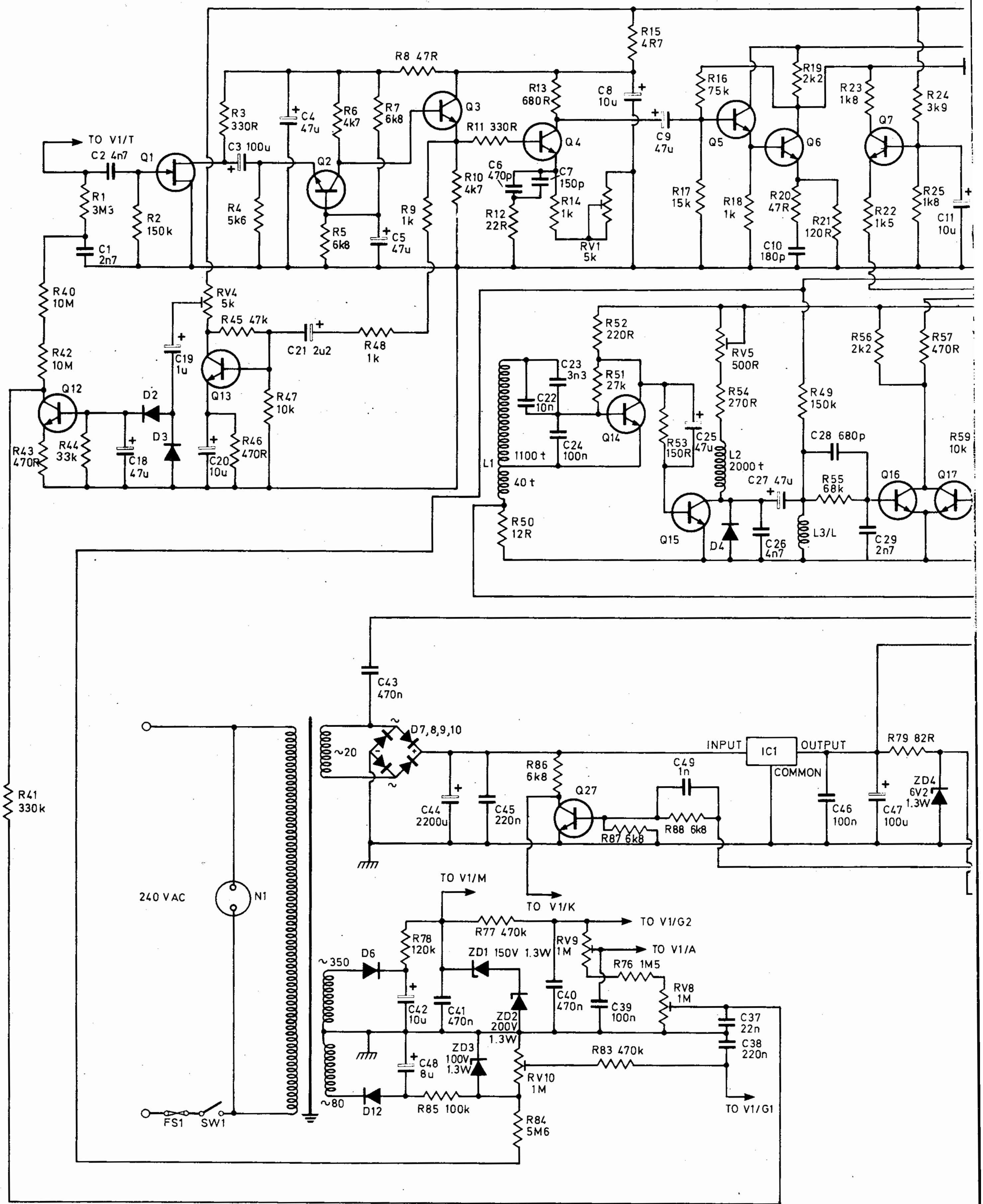
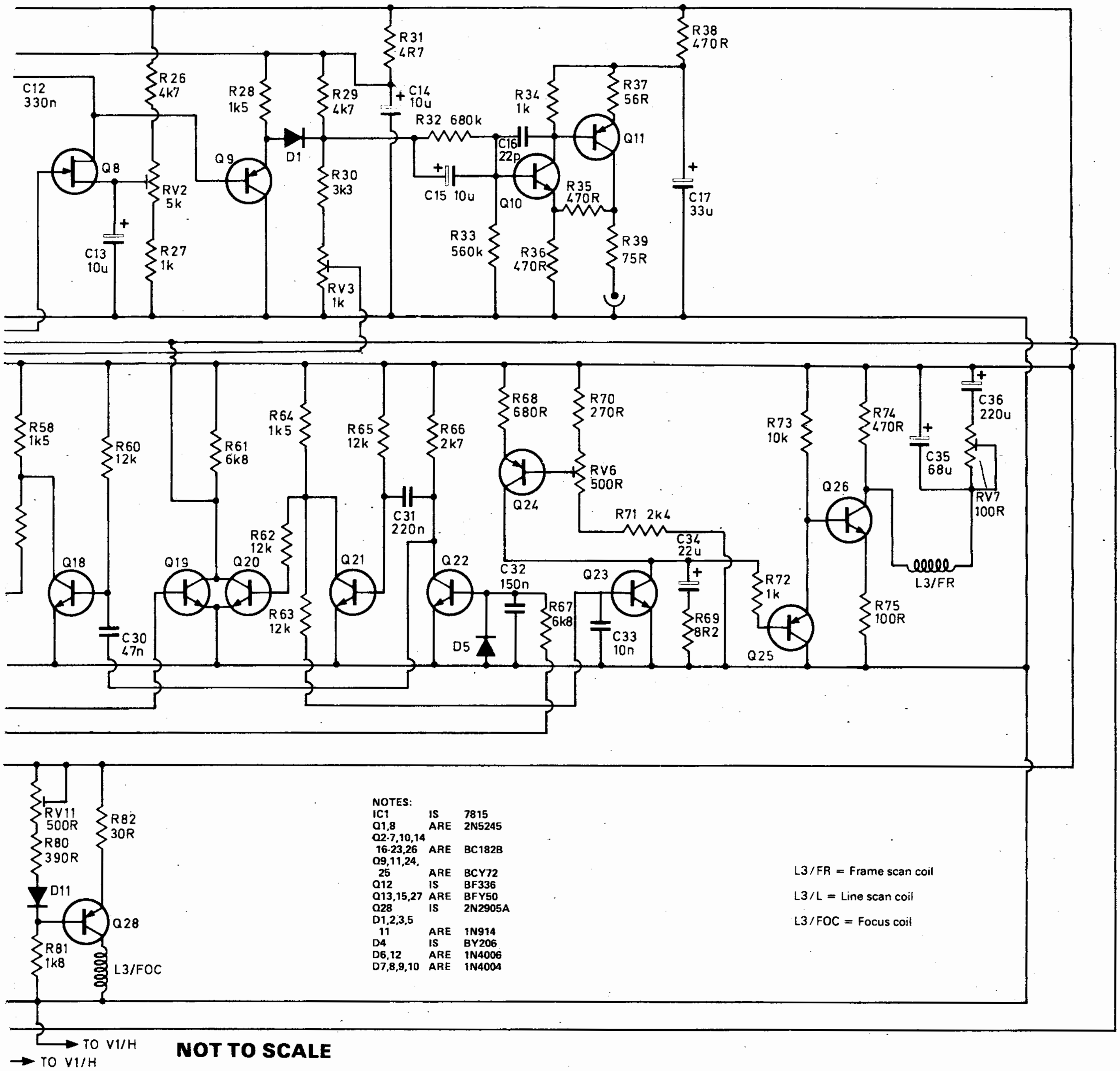


Fig. 2 Construction of a typical vidicon tube is shown to the right.

CCTV CAMERA


TO V1/T
C2 4n7
Q1
R1 3M3
R2 150k
C1 2n7
C3 100u
R3 330R
C4 47u
R4 5k6
Q2
R5 6k8
R6 4k7
R7 6k8
C5 47u
R8 47R
Q3
R9 1k
R10 4k7
R11 330R
Q4
C6 470p
C7 150p
R12 22R
R13 680R
R14 1k
RV1 5k
R15 4R7
C8 10u
C9 47u
R16 75k
R17 15k
Q5
R18 1k
Q6
R19 2k2
R20 47R
R21 120R
C10 180p
R23 1k8
Q7
R22 1k5
R24 3k9
R25 1k8
C11 10u
R40 10M
R42 10M
Q12
R43 470R
R44 33k
C18 47u
D2
D3
C19 1u
RV4 5k
R45 47k
Q13
C20 10u
R46 470R
R47 10k
C21 2u2
R48 1k
R41 330k
R52 220R
C23 3n3
C22 10n
C24 100n
R51 27k
Q14
L1
1100 t
40 t
R50 12R
R53 150R
C25 47u
RV5 500R
R54 270R
L2 2000 t
Q15
D4
C26 4n7
C27 47u
R49 150k
C28 680p
R55 68k
L3/L
C29 2n7
R56 2k2
R57 470R
Q16
Q17
R59 10k
C43 470n
~20
D7,8,9,10
C44 2200u
C45 220n
R86 6k8
Q27
R87 6k8
R88 6k8
C49 1n
INPUT
IC1
OUTPUT
COMMON
C46 100n
C47 100u
R79 82R
ZD4 6V2 1.3W
240 VAC
N1
FS1
SW1
~350
~80
D6
D12
R78 120k
C42 10u
C48 8u
TO V1/M
R77 470k
ZD1 150V 1.3W
C41 470n
ZD2 200V 1.3W
ZD3 100V 1.3W
R85 100k
TO V1/K
TO V1/G2
RV9 1M
TO V1/A
R76 1M5
C40 470n
C39 100n
RV8 1M
C37 22n
C38 220n
R83 470k
RV10 1M
R84 5M6
TO V1/G1



NOTES:

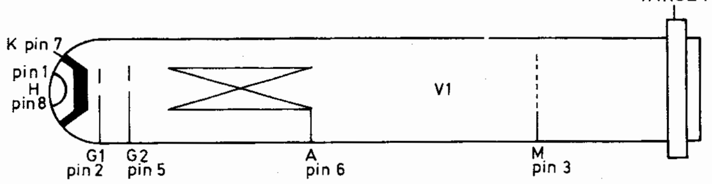
IC1	IS	7815
Q1,8	ARE	2N5245
Q2-7,10,14 16-23,26	ARE	BC182B
Q9,11,24, 25	ARE	BCY72
Q12	IS	BF336
Q13,15,27	ARE	BFY50
Q28	IS	2N2905A
D1,2,3,5 11	ARE	1N914
D4	IS	BY206
D6,12	ARE	1N4006
D7,8,9,10	ARE	1N4004

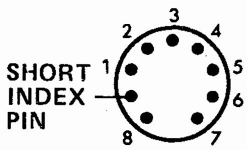
L3/FR = Frame scan coil

L3/L = Line scan coil

L3/FOC = Focus coil

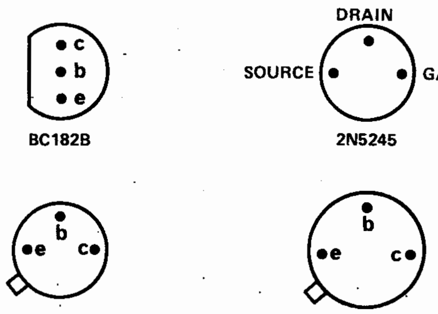
NOT TO SCALE





V1 BASE

BASE LEADOUTS



ALL VIEWED FROM BELOW

The full circuit diagram of the camera together with the pin designations of the vidicon tube and base connection diagrams for the various semiconductor devices used in the design.

CCTV CAMERA

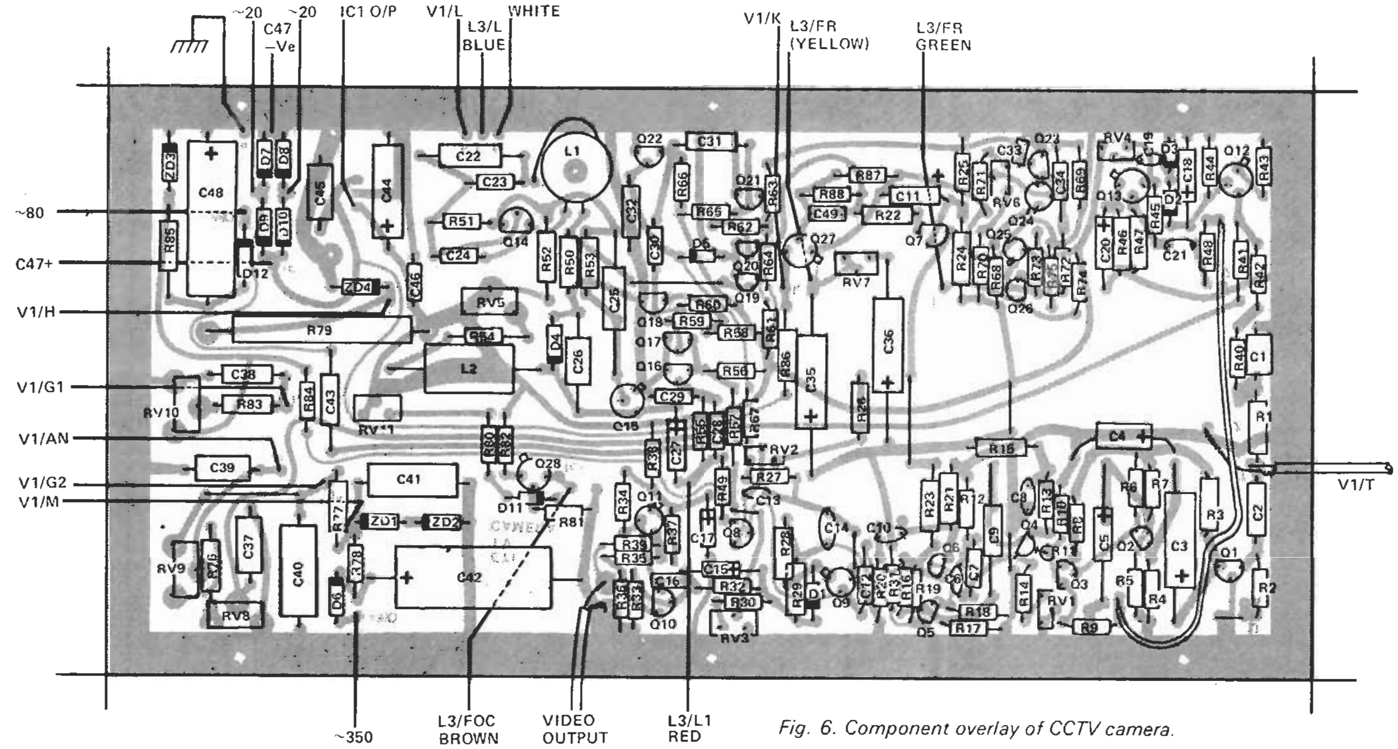


Fig. 6. Component overlay of CCTV camera.

camera's chassis. IC1 should also be mounted on the chassis, taking care that there is a good thermal contact between the regulator and chassis as the device dissipates a fair amount of heat in normal operation.

You will notice that we do not give any constructional details of the scan/focus coil (L3) or of coils L1 and L2. This is because we feel it would be almost impossible for the home constructor to produce items of

PARTS LIST

RESISTORS
(All resistors ¼W 5% unless otherwise stated)

R1	3M3	½W 10%
R2,49	150k	
R3,11	330R	
R4	5k6	
R5,7,61,67,87,88	6k8	
R6,10,26,29	4k7	
R8,20	47R	
R9,14,18,27,34,48,72	1k	
R12	22R	
R13,68	680R	
R15,31	4R7	
R16	75k	
R17	15k	
R19,56	2k2	
R21	120R	
R22,28,58,64	1k5	
R23	1k8	½W 5%
R24	3k9	
R25,81	1k8	
R30	3k3	
R32	680k	
R33	560k	
R35,36,43,46,57,74	470R	
R37	56R	
R38	470R	½W 5%
R39	75R	
R40,42	10M	¼W 10%
R41	330k	½W 5%
R44	33k	
R45	47k	
R47,59,73	10k	
R50	12R	½W 5%
R51	27k	
R52	220R	½W 5%
R53	150R	
R54	270R	½W 5%
R55	68k	
R60,62,63,65	12k	
R66	2k7	
R69	8R2	
R70	270R	
R71	2k4	
R75	100R	
R76	1M5	½W 5%
R77,83	470k	
R78	120k	½W 5%
R79	82R	7W 5%
R80	390R	
R82	30R	½W 5%
R84	5M6	¼W 10%
R85	100k	
R86	6k8	½W 5%

CAPACITORS

C1,29	2n7	125 V	Polystyrene
C2	4n7	160 V	Polystyrene
C3,47	100u	25 V	Electrolytic
C4,5,9,25	47u	25 V	Electrolytic
C6	470p	63 V	Ceramic
C7	150p	160 V	Polystyrene
C8,13,14	10u	20 V	Tantalum
C10	180p	63 V	Ceramic
C11,15,20	10u	25 V	Electrolytic
C12	330n	250V	Polyester
C16	22p	160 V	Polystyrene
C17	33u	16 V	Electrolytic
C18	47u	10 V	Electrolytic
C19	1u	35 V	Tantalum
C21	2u2	15 V	Tantalum
C22	10n	160 V	Polystyrene
C23	3n3	160 V	Polystyrene
C24,46	100n	250 V	Polyester
C26	4n7	160 V	Polystyrene
C27	47u	10 V	Electrolytic
C28	680p	100 V	Ceramic
C30	47n	10 V	Polyester
C31,38,45	220n	250 V	Polyester
C32	150n	250 V	Polyester
C33	10n	250 V	Polyester
C34	22u	25 V	Electrolytic
C35	68u	16 V	Electrolytic
C36	220u	16 V	Electrolytic
C37	22n	250 V	Polyester
C39	100n	400 V	Polyester
C40,41	470n	400 V	Polyester
C42	10u	450 V	Electrolytic
C43	470n	250 V	Polyester
C44	2200u	35 V	Electrolytic
C48	8u	150 V	Electrolytic
C49	1n	100 V	Ceramic

POTENTIOMETERS

RV1,2,4	5k lin
RV3	1k lin
RV5,6,11	500R lin
RV7	100R lin
RV8,9,10	1M lin

SEMICONDUCTORS

Q1,8	2N5245
Q2-7,10,14 16-23,26	BC182B
Q9,11,24,25	BCY72
Q12	BF336
Q13,15,27	BFY50
Q28	2N2905A
D1,2,3,5,11	1N914
D4	BY206
D6,12	1N4006
D7,8,9,10	1N4004
ZD1	150V 1.3 W
ZD2	200V 1.3 W
ZD3	100V 1.3 W
ZD4	6V2 1.3. W

BUY LINES

A complete kit of parts for this project is available from Crofton Electronics at 35, Grosvenor Road, Twickenham, Middlesex.

Crofton are also sole suppliers of the non-standard components used in the camera and will supply these items individually if required.

this type that were capable of giving acceptable performance.

We have arranged for these coils to be available ready built, see Buy Lines.

CAMERA

When construction of the camera is complete it is wise to carefully check that all is in order, a wiring error could prove expensive. It is also worth bearing in mind that there are some high voltages present at certain points in the circuit so it is not wise to prod around inside the camera with quite the same gay abandon that one might with a 9 V transistor radio.

When reasonably confident that everything is as it should be set up the eleven preset potentiometers to the positions shown in Table 1 and set the beam alignment magnets at

VIDICON

Type 9677 or similar (95 mA Heater)

LENS

Fujinon CCT V fixed
Focus lens type CF25C

SWITCH

Single pole on/off slide

TRANSFORMER

240 V – 350-0-80 plus 20 V (see Buy Lines)

INDUCTORS

L1	Line oscillator inductor
L2	Line Load inductor
L3	KV 9P/G Scan/Focus Coil

(See Buy Lines for the above inductors)

CASE

See Buy Lines.

MISCELLANEOUS

Grommet, 3-Core Mains Flex,
¼" Plastic P Clip, ¾" Capacitor Clamp,
Lens and scan coil mountings,
Base Connector for V1, Nuts, Bolts, Washers,
Ribbon wire, Screened cable, 250 mA fuse
plus 20 mm fuse holder, Neon, Video
output socket.

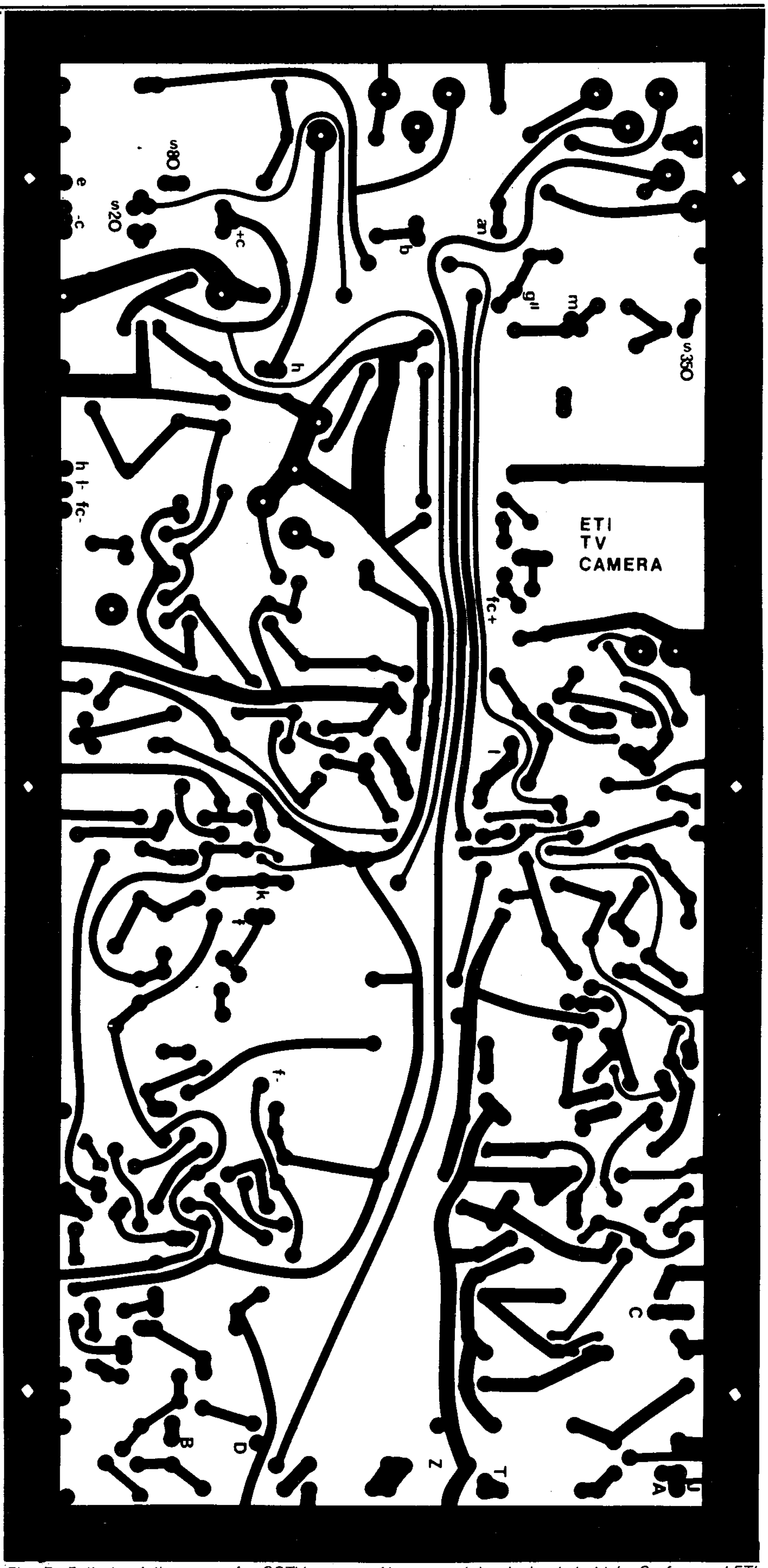


Fig. 7. Full size foil pattern for CCTV camera. Note copyright design is held by Crofton and ETI.

TABLE 1

RV1	LF PH	¾ Clockwise
RV2	PED	Centre position
RV3	SYNC AMP	7/8 Clockwise
RV4	ALC	Clockwise
RV5	L AMP	7/8 Clockwise
RV6	FR AMP	Anti-clockwise
RV7	FR LIN	Anti-clockwise
RV8	TARGET	Clockwise
RV9	FOCUS	¾ Clockwise
RV10	BEAM	Clockwise
RV11	MAG FOCUS	Clockwise

the rear of the scan coil to their neutral position, ie lugs together.

Before fitting the vidicon, carry out the checks and adjustments described below.

LINING UP

First check that with a nominal 240 V input the voltages at the points designated in Table 2 are correct.

Next set RV8 to give a voltage of 7V5 at the junction of C37 and the potentiometer's slider.

RV11 can then be adjusted so that the current in the focus coil of L3 is 90 mA. To perform this adjustment it will be necessary to remove one of the wires joining the focus coil to the PCB and insert a suitable multimeter.

The output of the camera should now be monitored on a 'scope to allow RV2 and RV3 calibrated. These controls set the amplitude of the pedestal and sync pulses respectively. The 'scope enables the levels of these pulses to be adjusted

HOW IT WORKS

As can be seen from the block diagram the electronics of the camera can be broken down into nine distinct sections.

This "How It Works" deals with the operation of each of these blocks in turn, the operation of the vidicon tube being dealt with elsewhere in this article.

VIDEO AMP

The signal output from the target of the vidicon (V1/T) is fed, via C2 which isolates the DC potential applied to the target from the following stages, to the gate of FET Q1. This FET is configured as a common source amplifier.

This stage, with its characteristic high input impedance, prevents any undue loading of the vidicon's output as, with the high output impedance associated with the vidicon, this would lead to degredation of signal quality.

The drain of Q1 is coupled by C3 to the emitter of Q2, a common-base stage. This stage features a low input impedance together with a high output impedance and provides a linear voltage gain of about 100.

We used a common-base stage at this point as this configuration is more stable at high frequencies than common-emitter amplifiers because of the very small capacitance linking input and output circuits (the emitter/collector capacitance).

From the collector of Q2 the signal is DC coupled to an emitter follower stage which provides a low impedance drive to the 'auto-light' circuit, described below, and to Q4, a common-emitter stage with a frequency compensating network as its emitter load.

This network, comprising R12, R14, RV1 (LF Phase), C6 and C7, allows the low frequency phase response of the circuit to be modified.

This compensating stage built around Q4 attenuates the video signal by a factor of four.

The signal appearing at the collector of Q4 is now taken via C9 to the DC coupled pair Q5, Q6. These devices provide a current driver and impedance matching stage.

The output from Q6 is fed to the collector of Q7, via R23, and to Q8 via C12.

Q7 inserts the mixed (line and frame) blanking signals and is dealt with below.

Q8 ensures that at the end of a line the video signal is returned to blanking level. This level is below the signal black level and results in the pedestal shown in the line signal waveform diagram.

In order to understand the operation of this part of the circuit we need to consider the action of Q8.

This is an N-channel depletion mode FET. This device may be thought of as a switch that is normally "on" but may be biased (turned) "off" by applying a voltage to the gate that is negative with respect to the source.

In the camera, Q8 is biased "off" by a gate voltage of − 3 Volts that is derived from the negative 100 V rail via R84. The gate is also provided with positive going pulses derived from the line oscillator stage which cause Q8 to turn "on" for 12 uS at the end of each line.

This effectively connects the base of Q9 to the DC level set by RV2 (Pedestal Level).

Thus at this stage we have a signal that is blanked, and held at blanking level, at the end of each line.

This signal, buffered by Q9, is fed via D1 to the junction of R29 and R30. These components, together with RV3 (Sync Amp), are responsible for inserting the mixed sync pulses into the signal. This action is described below.

D1 acts as a DC restorer. The composite video signal is then passed to an output stage comprising of the DC coupled pair Q10, Q11. This stage provides the 75R output impedance demanded in most CCTV applications.

'AUTO-LIGHT'

The 'auto-light' circuit is formed by Q13 and Q12.

The video signals is extracted from the emitter of Q3 and fed to the base of Q13 via C21 and R48. Q3 amplifies the signal by an amount determined by RV4 (ALC) auto light control.

This amplified signal is rectified by D2, DC restored positively by D3, and smoothed by C18 before being fed to Q12.

The collector of this transistor is taken to the junction of R41 and R42 which form part of the vidicon's target supply circuitry.

The collector current of Q12 will produce a voltage drop across R41 that will limit the vidicon's target voltage by an amount that depends upon the setting of RV4 and upon the level of the video signal.

This performs the ALC function.

LINE OSCILLATOR

The line oscillator is of unusual, but straightforward, design with component values chosen to give good temperature stability.

The oscillator is formed by Q14, L1 and associated components. The resistor R50 in series with the coil L1 is to ensure that the line blanking signal produced at the junction of R50 and L1 is of the correct width. This pulse is fed to the blanking mixer.

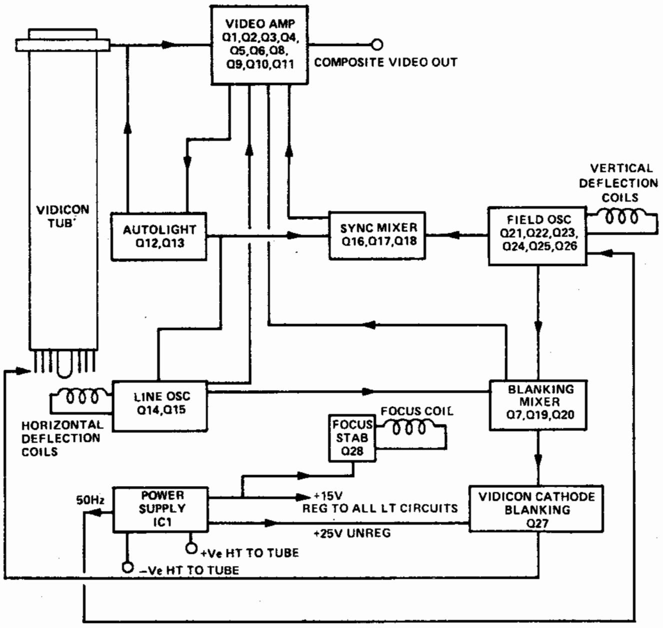


Fig. 4. Block diagram of the camera electronics

TABLE 2

D6 Cathode	+450 V
ZD1 Cathode	+350 V
D12 Anode	-130 V
ZD3 Anode	-100 V
IC1 Input	25 V
IC2 Output	15 V

Voltages at the above points should be within 10% of the stated values.

until they correspond with those shown in Fig 5. During this operation the camera's output should be terminated with a 75R load.

At this stage connect the camera to a monitor or, via a modulator, to a domestic TV set.

L1 can now be adjusted until the display on the TV screen stabilizes to a plain raster. By the way, do not adjust L1's core with a screwdriver as this is certain to break the core — we speak from experience.

If all the above is satisfactory the vidicon may be fitted. The vidicon is fitted from the front of camera and should be inserted to its full extent within the focus coil assembly. The tube should be aligned so that the short index pin of the base is at nine o'clock when viewed from the rear.

Tube installation is completed by tightening the tube clamp, cleaning the tube face with some tissue and fitting the lens mount to the front of the camera.

THE ELECTRONICS

The output of the line oscillator is taken from the collector of Q4 and passed via a pulse shaping network, R53 and C25, to the base of Q15.

The 0V5 pulse at this point produces a sinusoidal pulse of some 60 V at its collector. The collector load is formed by L2 (10 mH) together with R54 and RV5 (Line Amp). The latter allows adjustment of line width.

This sinusoidal pulse, when applied to the scan coils, L3/L, produces the required sawtooth current waveform.

Diode D4 is included to prevent negative overshoots of the waveform damaging Q15.

The line scan signal applied to L3/L is also fed to the sync mixing stage and to gate of Q8 which ensures the signal is maintained at blanking level at the end of a line as described above.

FIELD OSCILLATOR

The field scan waveform is formed by processing of a 50 Hz signal derived from the low tension winding of the mains transformer.

From the transformer, after DC isolation provided by C43, the 50 Hz waveform is passed, via R67, to the base of Q22.

Q22 is an overdriven amplifier and, with the pulse shaping provided by R67, C32 and D5, produces a square wave at its output. This square wave, after inversion, provides the field syn signal which is taken to the sync mixing stage.

The output from Q22 is also taken, via C31, to Q21. This transistor shapes the Q22 output to provide the field blanking signal. This in turn is fed to the blanking mixer.

This same signal is taken via R63 to the base of Q23 which forms part of the ramp generator that provides the field scan waveform.

The rest of the ramp generator is formed by Q24, a constant current generator. This presents a constant charge current to C34 and thus the voltage on this capacitor will increase in a linear fashion. This process will continue until Q23 conducts in response to the frame blanking signal applied to its base.

This discharges the capacitor rapidly, via current limit resistor R69, whereupon the cycle begins again.

The value of constant current supplied by Q24 can be adjusted by RV6 (Frame Amp). This control provides the field amplitude control.

The ramp waveform is taken to a current driver stage, Q25, and then to a voltage driver, Q26. This drives the frame scan coils, L3/FR, via C35.

RV7 (Frame Lin.) and C36 provide adjustment of the frame lineiarity.

BLANKING MIXER

The blanking mixer is formed by a collector mixer circuit comprising Q19 and Q20.

The line and frame pulses are applied to the bases of Q19 and Q20 respectively and the signal appearing in the common load resistor, R61, is the mixed blanking waveform.

This signal is applied to the emitter of Q7 and, after shaping, to the base of Q27.

Q7, biased by R24 and R25 with C11 decoupling, blanks the video signal from Q6 in response to the output from the blanking mixer.

VIDICON CATHODE BLANKING

Q27 provides cathode blanking of the vidicon. This transistor is fed from the 25 V unstabilised rail in order to ensure that the blanking pulse is of adequate amplitude.

SYNC MIXER

The sync mixer stage is very similar to the blanking mixer. It is formed by Q16 and Q17.

The line sync signal is fed via shaping network C28, R55 and C29, to the base of Q16. By delaying the start of this pulse with respect to the beginning of the blanking signal, and by restricting its width, we provide the front and back video porches.

Thus the line sync pulse is a 4 us pulse delayed 2 uS with respect to the start of the 12 uS blanking signal. This gives the 2 uS front porch and 6 uS back porch.

The field sync pulse is applied to Q17 and the mixed sync signal appears in the common collector load, R56.

This signal is applied to the slider of RV3 (sync amp) which inserts the mixed sync signal into the main signal path.

FOCUS

Q28 provides a constant current source for the focus coil, the current being set by RV11 (mag focus).

Diode D11 is included to prevent thermal drift.

POWER SUPPLY

The power supply is required to provide various voltages to the different sections of the circuit. These may be broken down into low tension (LT) and high tension (HT) voltages.

Most of the semiconductors require A 15 V supply which is provided by IC1. The cathode blanking transistor is fed from the unsmoothed 25 V rail that feeds IC1.

The HT voltages are provided by half wave rectification of the HT windings of T1.

Zener diodes ZD1, ZD2 and ZD3 together with RV8 (Target) RV9 (Focus) and RV10 (Beam) provide the various stabilized voltages required by the vidicon.

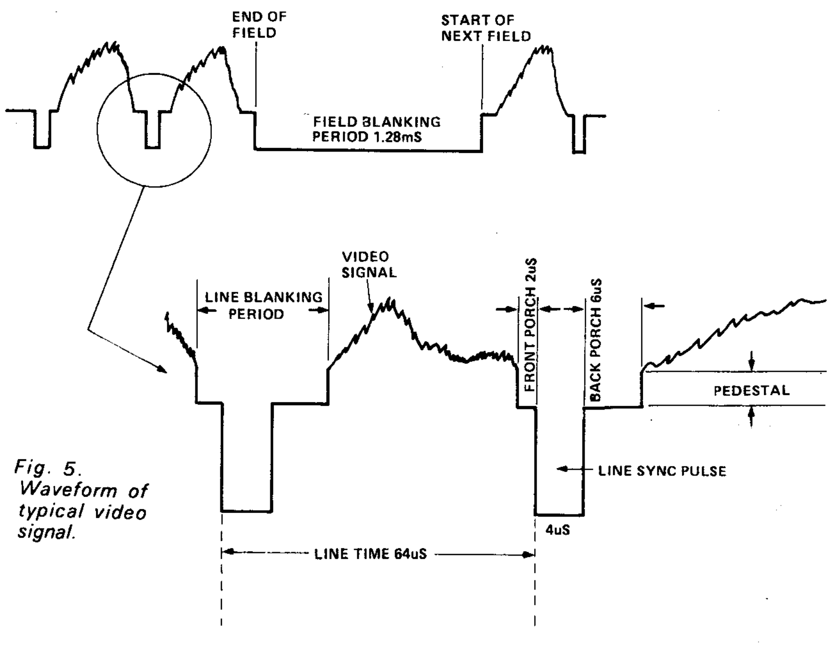


Fig. 5. Waveform of typical video signal.

CCTV CAMERA

Upon connecting the vidicon to the rest of the circuit, adjustment of RV10 should produce a picture of sorts.

RV5 and RV6 can now be set to produce the correct scanned area without corner cutting and an aspect ratio of 4:3. RV7, frame lin, should be adjusted as required.

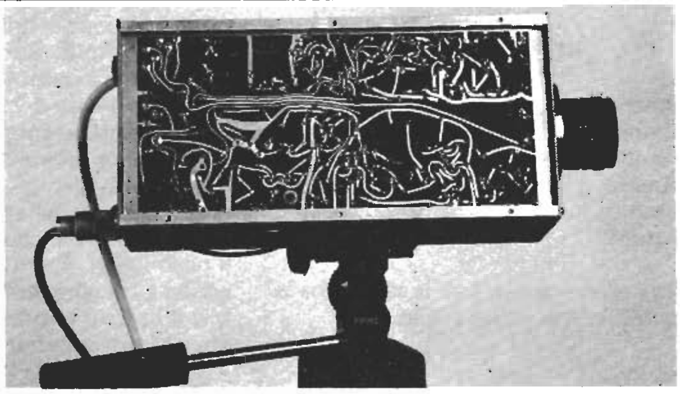
RV8 and RV9 can now be trimmed to provide the best possible picture.

Finally RV1 provides a means of reducing any picture smearing.

The only remaining electrical adjustment is the Auto Light Control. To calibrate this function, point the camera at an evenly lit (not brightly lit) scene. Reduce the lens iris to F4 and then trim RV8 to give a video output of 1V as monitored on a scope.

Open the iris one stop and adjust RV4 to return the video signal to its previous level.

Alignment of the camera is completed by slowly rotating the two tube alignment magnet lugs located at the rear of the scan coil. These should be set so that the picture rotates about its centre, no side to side or up and down motion, as RV9 (focus) is adjusted.



A view of the camera from above showing clearly the PCB and location of video output socket.

TYPE OF LENS

Before we move on to describe the use of the camera, just a word about the lens.

The lens specified in the parts list is a good quality CCTV camera lens and will provide excellent results. As with everything, however, good quality proves expensive.

A way of saving money in this area is to use a 35mm camera lens, together with special mount, with the camera. As many people will already have this type of lens this represents a considerable saving.

The 35mm lens will not provide the same level of performance as a purpose bought CCTV lens but does produce quite acceptable pictures.

USING THE CAMERA

In use, connect the camera to a monitor or TV set and after allowing sixty seconds for the vidicon to warm up, adjust the lens for best focus. It may be necessary to adjust both the brightness and contrast controls on the monitor to obtain the best picture.

The camera will produce excellent pictures in all lighting conditions from bright sunlight down to a typically lit domestic room.

The range of applications to which the camera can be put is, as we said at the beginning of this article, vast and we hope that exploring some of the possibilities will provide many hours of enjoyment. ETI