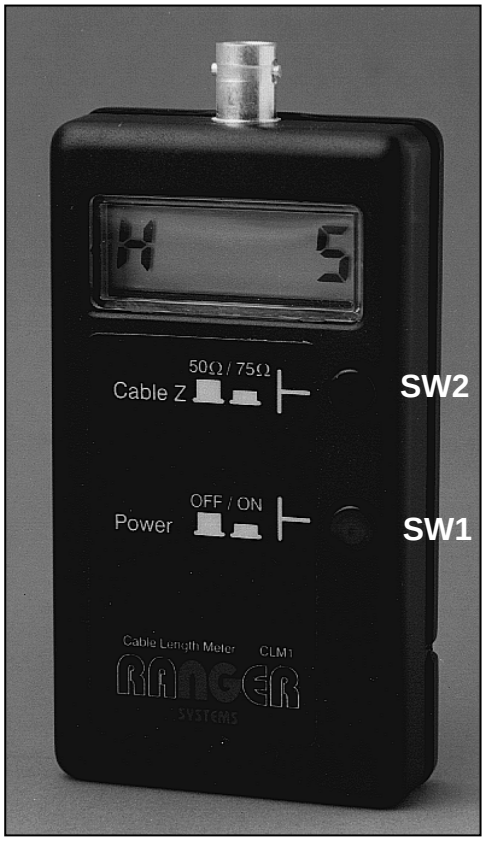
Cable Length Meter CLM1

Description

This meter produces a direct readout, in metres, of the length of an *unterminated* coaxial cable of type RG59 (75Ω) or RG58 (50Ω) or equivalent with a resolution of 2.5 metres.



Instructions

Only unterminated cables (completely open circuit or short circuit) will produce a correct reading on the LCD display, correctly, or partially terminated cables will produce an indeterminate reading. It is important, therefore, to confirm that any unknown cable to be measured is either short or open circuit by using an ohmmeter if necessary.

Cable length measurement and fault location

- Switch on the CLM1 (SW1 in) and select the appropriate impedance (SW2 in for 75Ω and SW2 out for 50Ω)
- Connect the cable under test to the BNC input of the CLM1.
- The readout will show the length of the cable in metres preceded by a letter 'H' or 'L'. ('H' indicates high impedance or open circuit; 'L' indicates low impedance or short circuit).

Cable lengths greater than 410 metres will produce an over-range reading of three dashes.

Finding a short circuit or open circuit in cable lengths greater than 400 metres

Although the maximum range of the CLM1 is 400 metres – as long as both ends of the suspect cable are accessible, the location of the fault will produce a reading from at least one end in cable runs of up to 800 metres.

Locating faulty connectors in BNC – BNC leads.

The identification of a faulty BNC plug is often difficult to determine, especially if open circuit. With BNC-BNC cables greater than 2.5 metres, the faulty connector will produce a reading of H 0 if open circuit or L 0 if short circuit.

Specification

Measurement range:	2.5 - 400 metres
Measurement method:	TDR (Time Domain Reflectometry)
Display accuracy:	± 1.5 metres
Measuring resolution:	2.5 metres
Power source:	PP3 Alkaline battery
Consumption:	37mA (off load)
Dimensions (overall):	118 x 60 x 29mm
Weight:	95g (with battery 140g)

Measuring Cable Length with RANGER

All cables have a finite propagation velocity (signal transmission speed), normally quoted by the cable manufacturers as a percentage of the speed of light (300Mm/s); standard coaxial cables used in CCTV work usually have a velocity of 67% (200Mm/s). These cables include Coax12, RG11, RG12, RG59 and URM70.

Each cable has its own characteristic impedance, (75Ω is usual in the case of video transmission), this is the load 'seen' by a signal as it enters the cable. The signal energy will travel down the cable at the quoted propagation velocity until it reaches the other end and, unless the cable is suitably terminated with a load equivalent to the cable impedance, the signal will simply be reflected back to the source. In other words, a 75Ω cable requires a 75Ω load to dissipate all of the signal energy received – any energy not dissipated at the destination is sent back to the source.

The length of the cable then determines the time it takes for a signal to complete a round trip and the CLM1 utilises this phenomenon by injecting a high-speed pulse and timing its return. It follows, therefore, that the length of a correctly terminated cable *cannot* be determined by this means since all of the energy will be absorbed by the terminating load.

So for meaningful readings from the CLM1, it is important to ensure that the cable under test is either short circuit or open circuit and *not* connected to any external equipment that may be capable of absorbing all, or even part of the energy of the transmitted pulse.

Although designed for direct reading of cable lengths in standard (V_p=200Mm/s) cable, the CLM1 may usefully be employed in the length measurement of cables of other speeds. A table (Table 2) is provided on the next page that may be used to convert the CLM1 reading to the actual length of the cable under test in accordance with its propagation velocity.

The following table provides a list of common CCTV coax types with their V_p and a guide to the estimated maximum length for a loss of 6dB (50% signal attenuation). The shaded area lists the standard cables from which a direct reading in metres can be read from the CLM1. Use table 2 to convert the readings for (unshaded) faster cables.

Coax Type	Speed V_p(%)	Length for 6dB loss (metres)
COAX12	67	331
URM70	67	255
RG11	67	492
RG12	67	492
RG59	67	269
RG6	82	332
SAT100	82	371
CT100	82	456
CT125	83	540
H43AL	83	689
CT167	84	742
CT233	84	990
CT264	84	1187
CT305	85	2892

Table 1

Cable propagation velocity and estimated (unamplified) run length for a 6dB loss in CCTV signal strength. Shaded area indicates cables that produce a direct reading from the CLM1, use table 2 to convert CLM readings to suit cable speed.

Conversion Chart for Faster Cables

For faster cables, connect the CLM1 in the usual way and use the following table to convert the CLM reading to the actual cable length according to its speed as given in table 1.

For example, if the cable under test is CT125 (V_p=83% according to table 1) and the CLM shows a reading of 235 then the cable length is 291 metres according to the following table.

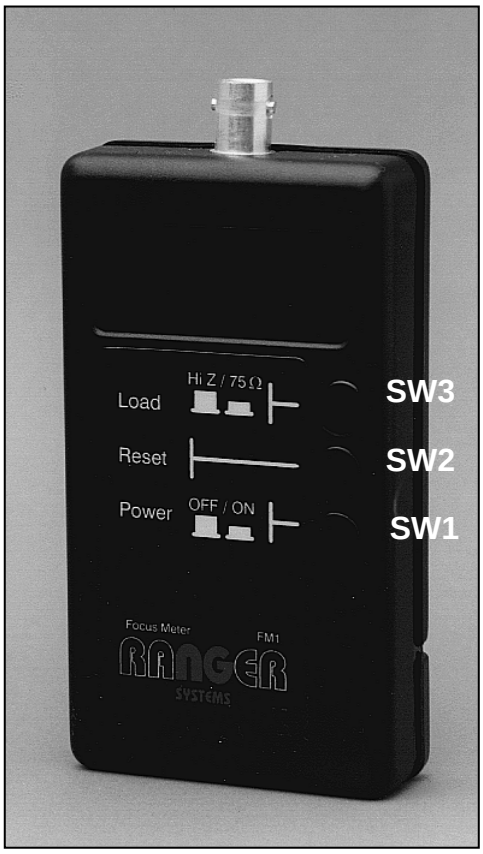
CLM	82	83	84	85	CLM	82	83	84	85
5	6	6	6	6	**210**	257	260	263	266
10	12	12	13	13	**215**	263	266	270	273
15	18	19	19	19	**220**	269	273	276	279
20	24	25	25	25	**225**	275	279	282	285
25	31	31	31	32	**230**	281	285	288	292
30	37	37	38	38	**235**	288	291	295	298
35	43	43	44	44	**240**	294	297	301	304
40	49	50	50	51	**245**	300	304	307	311
45	55	56	56	57	**250**	306	310	313	317
50	61	62	63	63	**255**	312	316	320	324
55	67	68	69	70	**260**	318	322	326	330
60	73	74	75	76	**265**	324	328	332	336
65	80	81	81	82	**270**	330	334	339	343
70	86	87	88	89	**275**	337	341	345	349
75	92	93	94	95	**280**	343	347	351	355
80	98	99	100	101	**285**	349	353	357	362
85	104	105	107	108	**290**	355	359	364	368
90	110	111	113	114	**295**	361	365	370	374
95	116	118	119	121	**300**	367	372	376	381
100	122	124	125	127	**305**	373	378	382	387
105	129	130	132	133	**310**	379	384	389	393
110	135	136	138	140	**315**	386	390	395	400
115	141	142	144	146	**320**	392	396	401	406
120	147	149	150	152	**325**	398	403	407	412
125	153	155	157	159	**330**	404	409	414	419
130	159	161	163	165	**335**	410	415	420	425
135	165	167	169	171	**340**	416	421	426	431
140	171	173	176	178	**345**	422	427	433	438
145	177	180	182	184	**350**	428	434	439	444
150	184	186	188	190	**355**	434	440	445	450
155	190	192	194	197	**360**	441	446	451	457
160	196	198	201	203	**365**	447	452	458	463
165	202	204	207	209	**370**	453	458	464	469
170	208	211	213	216	**375**	459	465	470	476
175	214	217	219	222	**380**	465	471	476	482
180	220	223	226	228	**385**	471	477	483	488
185	226	229	232	235	**390**	477	483	489	495
190	233	235	238	241	**395**	483	489	495	501
195	239	242	244	247	**400**	490	496	501	507
200	245	248	251	254	**405**	496	502	508	514
205	251	254	257	260	**410**	502	508	514	520

Table 2

Focus Meter FM1

Operation

1. Switch the unit on (SW1 in), the display will flash all LED's in the absence of a video signal.
2. Connect the camera output to the Focus meter, selecting high impedance (SW3 out) or 75Ω (SW3 in) to establish correct loading.
3. Press and release RESET (SW2)
4. Slowly rotate the camera focus ring fully in both directions taking care not to obstruct the lens from its normal view.
5. Set the lens for correct focus by rotating the focus ring for maximum LED readout.



Notes

The focus meter operates by analysing and measuring the picture detail at the centre of the picture. Since picture detail will vary from scene to scene, the meter automatically adjusts its display range to provide an optimum readout.

If the scene changes during adjustment, due to accidental camera movement or inadvertently blocking the lens for example, the display range may require resetting by repeating the above instructions from stage 3.

Specification

Input impedance:	High Z / 75Ω
Power source:	PP3 Alkaline battery
Consumption:	30mA (max)
Dimensions (overall):	118 x 60 x 29mm
Weight:	80g (with battery 125g)

Test Card Generator TCG1

This generator provides a standard 75Ω, 1-volt p-p; PAL encoded CCIR video signal for the testing of monitors and other CCTV equipment.

One of four patterns may be selected using SW2 & SW3:

SW2/3	Pattern
Out/Out	White raster
Out/In	Red Raster
In/Out	Colour bars
In/In	Composite Test Card

The composite test card pattern incorporates 100% colour bars, grey scale, crosshatch, colour castellations and “mail box” pattern for checking LF response.

Specification

Output:	1-volt p-p into 75Ω
Line frequency:	15,625 Hz
Field frequency:	50 Hz interlaced
Chroma subcarrier frequency:	4.43361875 MHz
Colour system:	PAL
Power source:	PP3 Alkaline battery (Socket for optional 9v adapter)
Consumption:	50mA (off load)
Dimensions (overall):	118 x 60 x 29mm
Weight:	80g (with battery 125g)

Video Level Meter VLM1 MK1

The meter is capable of measuring peak white (sync tips to peak white) and sync level (black level to sync tips)

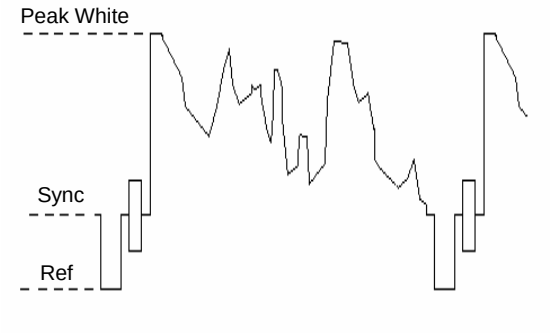
For accurate results, the signal under test must be correctly terminated and for this purpose, a hi-Z/75Ω input impedance switch is provided.

A standard, 1-volt peak to peak video signal will normally measure 0.30 volts with a peak white value of 1.00 volts. Since the peak white value is dependent on video content, it is advisable to set video amplifier gain etc. by reference to the sync level reading.

The Display

The three right-most characters on the LCD display provides a measurement readout in volts whilst left-most character is used to indicate the operating mode.

The 'P' segment will flash to indicate Peak Level is being read whilst the 'S' segment will flash to denote Sync Level measurement. *Any signal above 2.5 volts peak (0.75 volts sync) will produce an over-range display of three dashes.*



Spurious readings may be experienced in the absence of a video signal input, particularly when switched to hi-Z mode.

The display will often take several seconds to stabilise when the instrument is subjected to sudden large changes in video input level (switching from 75Ω to hi-Z for example).

Specification

Input range – Sync:	100mV - 750mV
Peak:	100mV - 2.5V
Input impedance:	High Z / 75Ω
Power source:	PP3 Alkaline battery
Consumption:	2.5mA
Dimensions (overall):	118 x 60 x 29mm
Weight:	95g (with battery 140g)

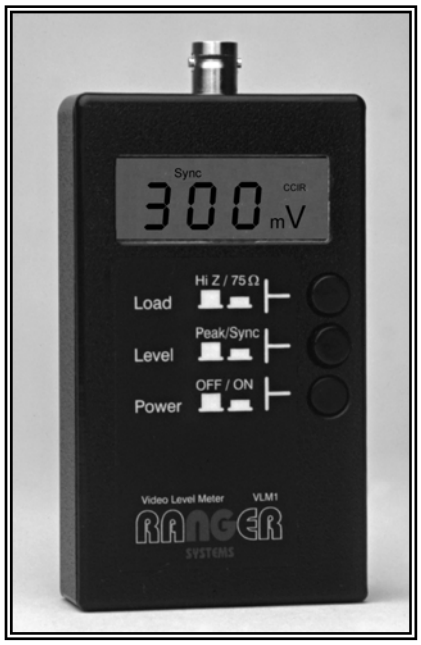
Video Level Meter VLM1 MKII

The VLM1 now has a new improved LCD display.

The meter is capable of measuring peak white (sync tips to peak white) and sync level (black level to sync tips)

For accurate results, the signal under test must be correctly terminated and for this purpose, a hi-Z/75Ω input impedance switch is provided.

A standard, 1-volt peak to peak video signal will normally measure 300mV with a peak white value of 1.00 volts. Since the peak white value is dependent on video content, it is advisable to set video amplifier gain etc. by reference to the sync level reading.



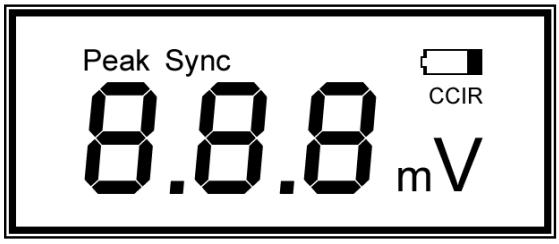


Fig 1 *The VLM1 MKII Display*

The Display

Two annunciators “Peak” and “Sync” define the current measurement mode as Peak White and Sync Level respectively. In the Sync mode a reading of 90mV to 1.05V may be displayed being the measured voltage between ‘Ref’ and ‘Sync’ (see fig 2 below).

In Peak White mode, a reading between 300mV (0.3 volts) and 3.5 volts will show the measured voltage between ‘Ref’ and ‘Peak White’. (The meter will automatically switch from millivolts to volts for readings above 1 volt).

The VLM1 is designed for the measurement of standard CCIR signals (as used by most European countries that adopt the PAL colour TV standard) and an annunciator is provided to indicate that the signal under test is of that form. Another meter compatible with both CCIR and EIA (North America) is available separately from NG Systems, part number VLM2.

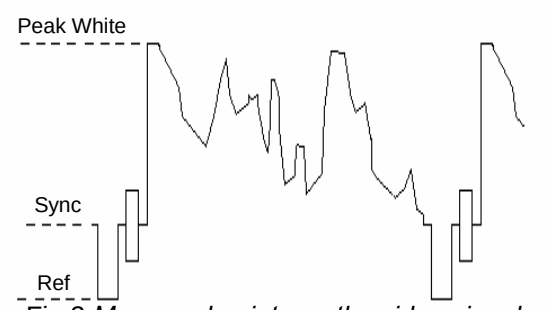


Fig 2 *Measured points on the video signal*

To switch between Sync and Peak White mode, press and release the Level button.

To preserve battery life, the VLM1 will automatically power down in approximately 3 minutes under no signal conditions. To resume operation switch the power button off for 1 second and then on again.

If the battery low indicator shows,  the battery should be replaced as soon as possible.

Note: The display will often take several seconds to stabilise when the instrument is subjected to large changes in input level (switching from 75Ω to hi-Z for example).

Specification

Input range – Sync:	90mV – 1.05V
Peak:	300mV – 3.5 V
Input impedance:	High Z / 75Ω
Power source:	PP3 Alkaline battery
Consumption:	8 mA
Dimensions (overall):	118 x 60 x 29mm
Weight:	95g (with battery 140g)

Phase Meter PM1

The phase meter provides a simple method of synchronising the field sync between line-locked cameras without the need of a dual-trace oscilloscope – to prevent picture roll when switching cameras.

OPERATION

1. Connect the reference input to either input A or B on the phase meter.
2. Connect the camera to be adjusted to the remaining input.
3. Set the Load switch on the phase meter to 75Ω or HiZ to correctly load both signals.
4. Adjust the phase control on the camera until all LEDs on the phase meter are extinguished.

When all lights are extinguished, the field sync of both signals are in step (±½ horizontal line).

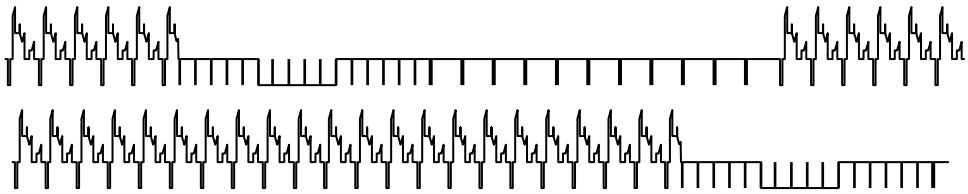


Fig 1. Cameras out of phase, switching causes picture roll – several LEDs on PM1 lit.

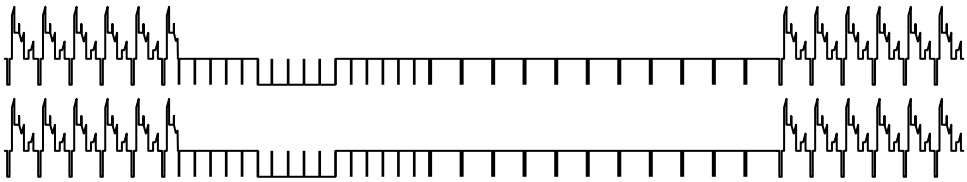


Fig 2. Cameras in phase, no picture roll during switching – LEDs on PM1 extinguished.

Specification

Video system:	625 line CCIR
Input impedance:	75Ω/HiZ
Power source:	PP3 Alkaline battery
Consumption:	12.5mA (max)
Dimensions (overall):	118 x 60 x 29mm
Weight:	85g (with battery 130g)