RC 2000

Diverse

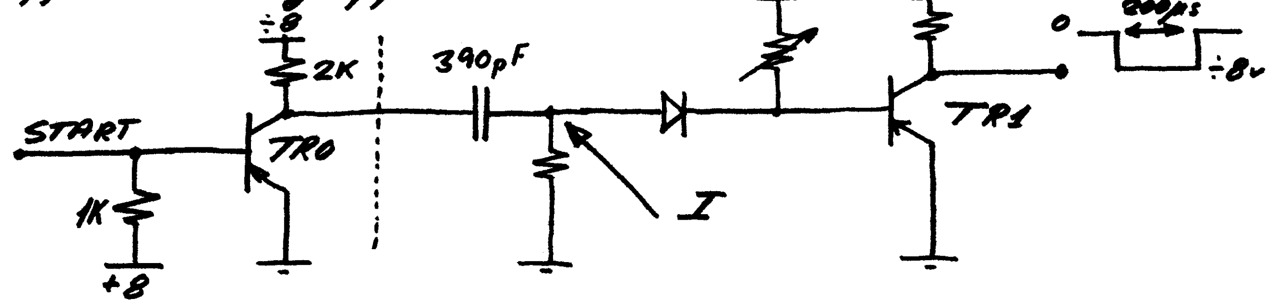
Navn	Lb. nr.	Dato	Emne	Fag	Afd.	Side
		780112				1

RC 2000 Landbohøjskolen.

Læseren er tilpasset en IBM 1130.
I den anledning er der foretaget ændringer i START, $\overline{BUSY}$ og dataledningerne fra læseren.

Inden ændringerne fulgte BUSY flip-flop'en RA, som blev sat af ~~R~~ START.

Indgangen START har nu følgende udseende:
(pp. 37 A og pp 38A):



TR1 er en transistor i en monostabil multivibrator (pp 37 A), som normalt er ON.
Multivibratoren trigges af et positivt gående spring på indgangen I, d.v.s når TR0 går ON. Den monostabile multivibrator har en impulslængde på 200 µs, hvorfor collector på TR1 er ÷8v i 200µs, mens sRA er inverteret. (sRA : sæt flip flop RA).

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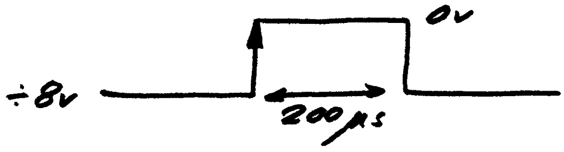
		780112				2

sRA har da følgende udseende:



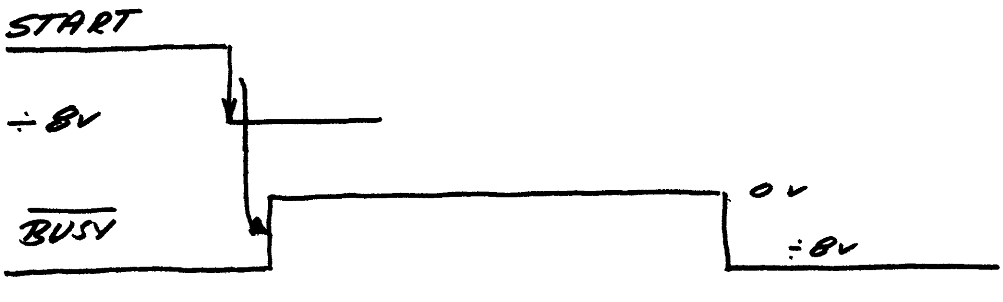
Flip-flop RA sættes på den positivt gående flanke altså på forflanken, hvilket også er på forflanken af start. Der går mindst 200 μs inden RA kan sættes igen.

$\overline{BUSY}$ (pp 37A) har følgende udseende:

Når TR3 ~~er~~ ON er $\overline{BUSY}$ 0v
Når TR3 er OFF er $\overline{BUSY}$ ÷8v

TR3 er ON når <u>enten</u> multivibratoren er trigget <u>eller</u> ZFB* er ÷8v.

Antag ZFB* = 0.



Navn	Lb. nr.	Dato	Emne	Fag	Afd.	Side
		780112				3

ZFB* har samme polaritet som ZFB, der angiver at bufferlageret er tomt. (pp 25)

ZFB* er ÷8v, når buffer er tom eller når der er reset.

Bemærk at der er spikes på ZFB og dermed på ZFB* og på $\overline{BUSY}$.

Når $\overline{BUSY}$ er 0 volt gælder en af

1. Der udføres en læsning i bufferlageret til registeret OUT.
2. Bufferlageret er tomt.
3. Bufferen resettes.

Den monostabile multivibrator startes af START uanset ZBF og RESET, selv om en læsning ikke startes.

Navn	Lb. nr.	Dato	Emne	Fag	Afd.	Side
		780112				4

STYRING AF LÆSER

Læseren tænkes styret på den måde, at hver gang ID 7000 læser tegnet i OUT, genererer interfacekortet en startimpuls, som medfører, at der læses et nyt tegn til OUT.

Mikrodatamaten kan læse tegnet i OUT, når BUSY er ÷8v; når BUSY skifter fra 0v til ÷8v kan interfacekortet afbryde ID 7000.

Denne styring har følgende egenskaber:

Når lageret resettes bliver BUSY 0v.
Når reset er færdig påbegyndes indlæsning af strimmel til lager (Spikes på BUSY). Når den første karakter er indlæst i lageret bliver BUSY ÷8v, og der sendes afbrydelse til ID 7000, som herefter læser indholdet af out, som ikke er et ønsket tegn. Ved læsning af dette tegn sendes startpuls til læseren og herefter foregår læsningen normalt, d.v.s hver gang BUSY ændres fra 0v til ÷8v sendes afbrydelse til ID 7000, som læser tegnet i out hvorved der genereres en ny startimpuls til læseren som læser næste tegn o.s.v.

Navn	Lb. nr.	Dato	Emne	Fag	Afd.	Side
						5

Når det sidste tegn i bufferlageret læses til OUT skifter $\overline{BUSY}$ ikke til ÷8v, idet ZBF holder BUSY på 0v. ID 7000 får altså ingen afbrydelse, når det sidste tegn er i OUT. Dette problem kunne løses med en timer, men normalt er det sidste tegn uden betydning.

Navn	Lb. nr.	Dato	Emne	Fag	Afd.	Side

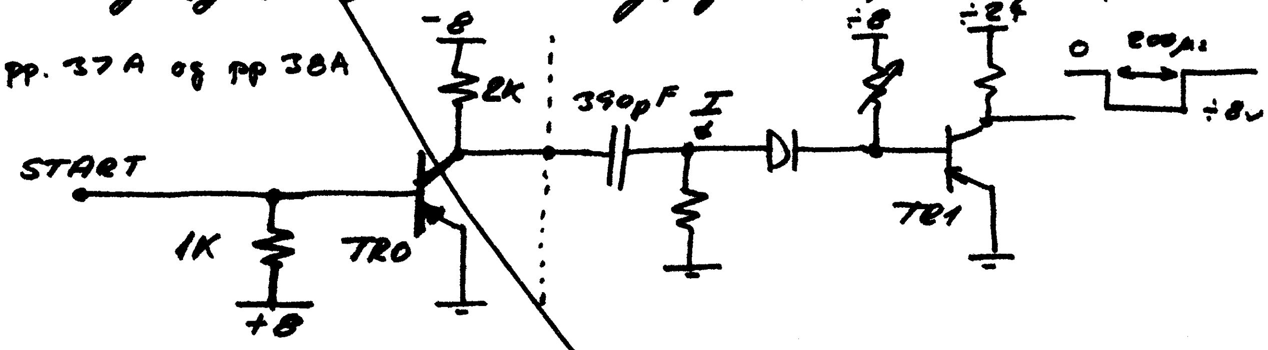
RC 2000 Landbohøjskolen.

Læseren er tilpasset en IBM 1130.
I den anledning er der foretaget ændringer i START, $\overline{BUSY}$ og data ledningerne fra læseren.

~~Oprindeligt Uden ændri~~

Inden ændringerne fulgte BUSY flip flop'en RA som blev sat af START.

Indgangen START har nu følgende udseende:



TR1 er en transistor i en monostabil multivibrator som i hvile er ON.

Multivibratoren trigges af et positivt gående spring på indgangen I d.v.s når TR0 går ON. Den monostabile multivibrator har en impulslængde på ca. 200 µs hvorfor collector på TR1 er -8v i 200 µs, mens sRA er inverteret (sRA: sæt flip flop RA).

SRA har da følgende udseende ÷8 

Flip Flop RA sættes på denne flanke altså på forkanten af start. (Der går mindst 200 µs inden RA kan sættes igen)

Navn	Lb. nr.	Dato	Emne	Fag	Afd.	Side

$\overline{BUSY}$ har følgende udseende:

Når TR3 er OFF er $\overline{BUSY}$ ÷8v.

Når TR3 er ON er $\overline{BUSY}$ 0v.

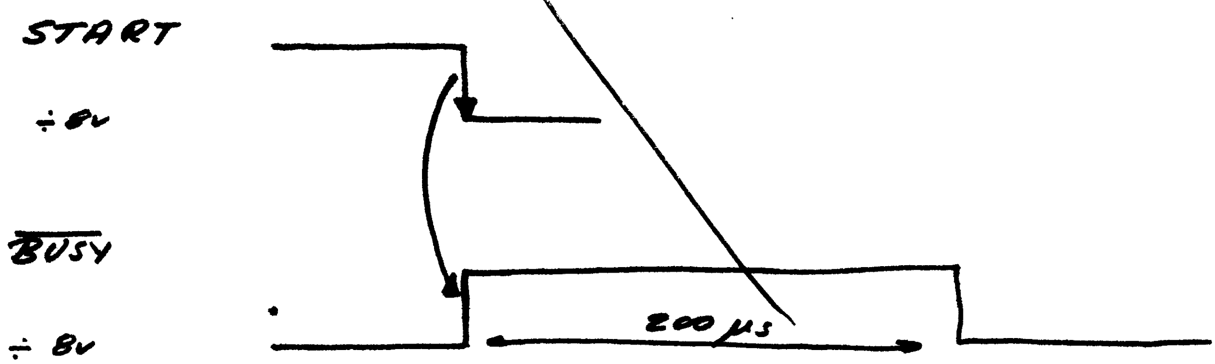
TR3 er ON når <u>enten</u>

Multivibratoren er trigget

<u>eller</u>

ZFB* er ÷8v

Antag ZFB* = 0v



ZFB* har samme polaritet som ZFB (~~page~~ pp 25 kort A0).

ZFB* er ÷8v når buffer er tom eller der er reset.

! Bemærk at der kan være spikes på <u>ZFB</u> og dermed på ZFB* og på $\overline{BUSY}$.

Navn	Lb. nr.	Dato	Emne	Fag	Afd.	Side

Hvis $\overline{BUSY}$ er 0 volt gælder en eller flere af følgende

1) ~~[illegible]~~ Der udføres en læsning i bufferlageret til registeret OUT.

2) Bufferen er tom.

3) Bufferen resettes.

Den monostabile multivibrator startes ~~når~~ uanset ZBF og RESET selv om en læsning ikke startes.

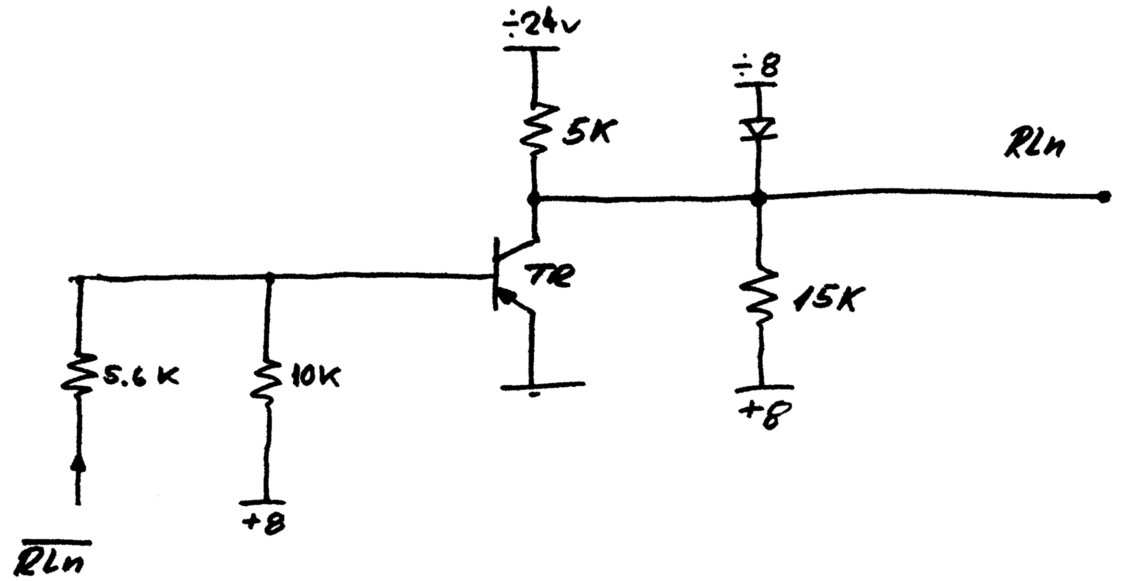
~~Hvis man kan starte en læsning når $\overline{BUSY}$ er ÷8v ved man~~

Man kan ikke uden videre anvende $\overline{BUSY}$ til at sample data i det skiftet fra 0 til ÷8v (bagkanten) også kommer når reset ophører eller når bufferen er tom.

Antag at der kun er 1 tegn i bufferen og at $\overline{BUSY}$ er ÷8v. Vi kan derfor sende start $\overline{BUSY}$ bliver straks 0 men da bufferen nu bliver tom hvornår bliver ~~la~~ $\overline{BUSY}$ da igen ÷8v ? Betyder dette at $\overline{BUSY}$ ikke kan anvendes ved sampling af data ?

Navn	Lb. nr.	Dato	Emne	Fag	Afd.	Side

Dataudgange (pp. 36 A)



TR spærret : RLn = ÷ 8v

TR ledende : " 0V

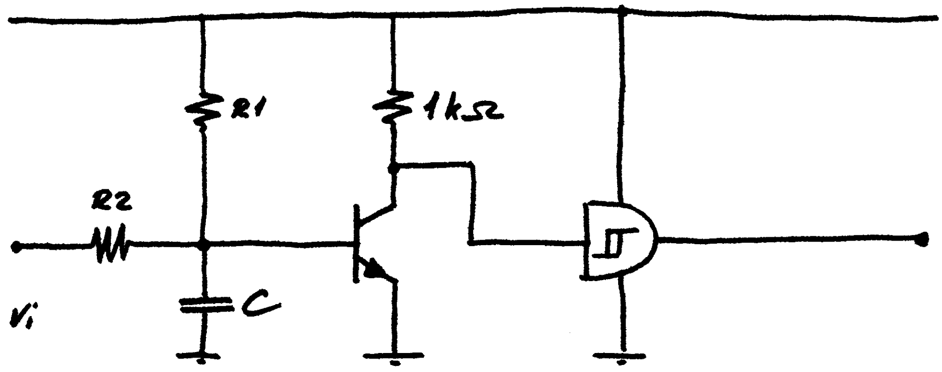
Ingen output er gated i den anden version. Data findes derimod både på sand og komplementær form.

Data udbestår af et register OUT med drivere af den angivne art.

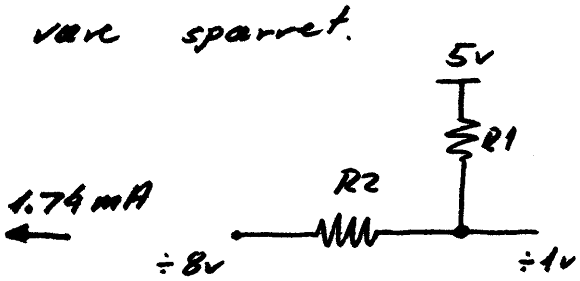
Navn	Lb. nr.	Dato	Emne	Fag	Afd.	Side

Konverteringskredsløb

Til TTL:



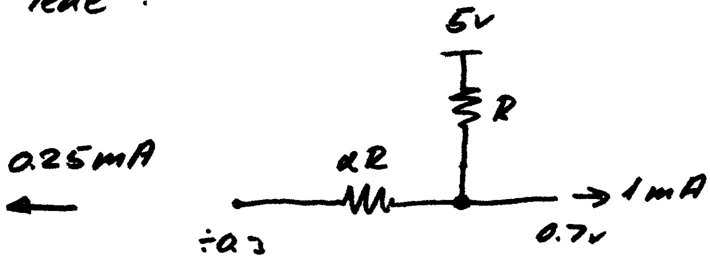
Når indgangsspændingen er ÷8v skal transistoren være spærret.



$$5 \div R1 \frac{13}{R1+R2} = \div 1$$

$$\alpha = \frac{R2}{R1} = 1.17$$

Når indgangsspændingen er ÷0.3 v skal transistoren lede:



$$\frac{4.3}{R} = 1 + \frac{1}{\alpha R}$$

$$\alpha R = R2 = 4.02$$

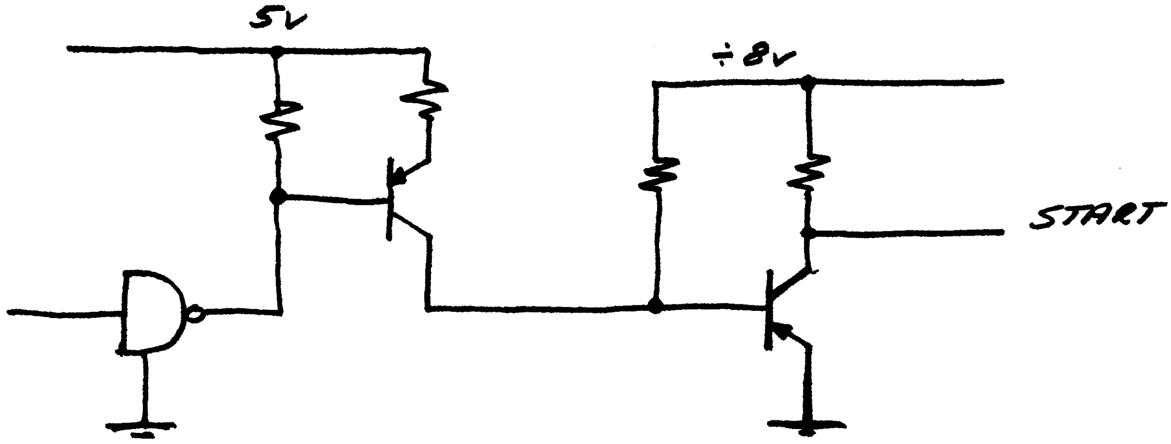
$$R = 3.44$$

For at fjerne spikes og støj kan kondensatoren C placeres som vist.

Der løber en DC strøm til laseren fra ID 7000

Navn	Lb. nr.	Dato	Emne	Fag	Afd.	Side

Konvertering fra TTL



~~Hvordan~~

Hvorfra tages ÷8v ?

Man kan eventuelt anvende $\overline{BUSY}$.

Man kan da ikke give en startpuls når $\overline{BUSY}$ er 0 volt hvilket er udmærket, men der opstår en asynkronsløjfe gennem kablet. Antag at $\overline{BUSY}$ = ÷8v ; vi laver nu en startpuls ved at sætte START = $\overline{BUSY}$ men herved bliver $\overline{BUSY}$ 0 volt.

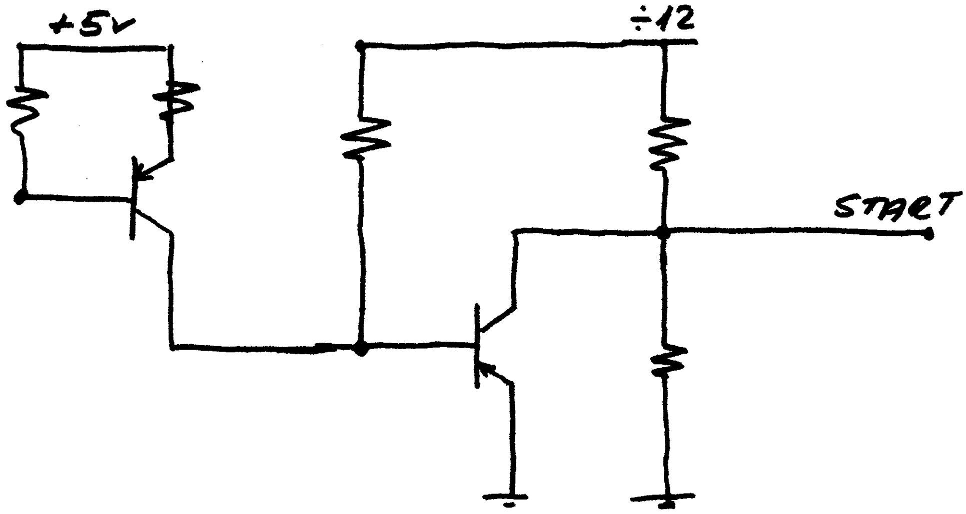
Den asynkrone sløjfe kan næppe aksepteres!

I stedet anvendes ID 7000 ÷12v forsyning!

Kredsløbet ser da ud som vist på følgende side.

Navn	Lb. nr.	Dato	Emne	Fag	Afd.	Side

Konvertering fra TTL.



Navn	Lb. nr.	Dato	Emne	Fag	Afd.	Side

Betjening af læser

Hvornår kan data indlæses til ID 7000 ? Bortset fra problemer med det sidste tegn kan dette ske, når læser er not BUSY.

Når en karakter læses fra buffer ønskes ny karakter da automatisk indlæst til register AT?

Da tiden er ca. 200 µs (hvis $\overline{BUSY}$ anvendes) kan WAIT ikke anvendes.

RA, WD og DO se pp 53

Navn	Lb. nr.	Dato	Emne	Fag	Afd.	Side
	5/1-78					1

Styring af PC 2000

Læseren er modificeret så man kun kan indlæse et tegn for hvert 200 μs. Ved styring af læseren kan man derfor ikke anvende wait, men må spørge på status eller give afbrydelser.

STATUS

BUSY = 1 : OPTAGET { i færd med læsning. / —"— reset / Buffer tom

PO×ZFB = 1 : Paper out og buffer tom.

PO = 1 : Paper out.

Når BUSY = 0 indeholder OUT en karakter.

Når ID 7000 læser en karakter fra OUT startes indlæsning af en ny karakter til OUT. Under denne indlæsning skifter BUSY til 1. Når BUSY igen skifter til 0 sendes afbrydelse til ID 7000, som da kan læse det nye tegn i OUT, hvorved en ny læsning påbegyndes.

Navn	Lb. nr.	Dato	Emne	Fag	Afd.	Side
						2

Når der kun er en karakter i bufferen og PO=1 indtræffer følgende:

ID 7000 henter den næstsidste karakter i OUT. Herved startes indlæsning af den sidste karakter til OUT. Da ZBF nu bliver 1 bliver BUSY aldrig 0 i dette tilfælde.

PO × ZBF = 1 skal derfor også give en afbrydelse. Når denne afbrydelse indtræffer kan sidste karakter indlæses fra OUT!

Der må ikke <u>sendes ny startpuls</u>

3.1 SUPPLIES

The instrument is normally despatched from the factory with the supply range switch on the rear panel set to the 240V (± 10%) range. Check that this is set correctly before connecting to the supply. Note that the correct fuse for the two high voltage ranges, 220V and 240V, is 500mA Slo-Blo (20mm) Advance Part No. 33685. If the 115V range is selected the fuse should be changed to a 1A Slo-Blo Advance Part No. 34790.

NOTE:
DO NOT CHANGE THE SUPPLY RANGE SWITCH WITH THE INSTRUMENT CONNECTED TO THE SUPPLY.

While the instrument does not rely on forced air circulation, it should not be operated at elevated temperatures if the natural connection cooling is restricted, particularly at the rear of the instrument.

The instrument is switched on by pressing the POWER button when the associated neon indicator should light. The button is self locking and the instrument is switched off by pressing the button again.

3.2 C.R.T. CONTROLS

These controls are grouped to the right of the c.r.t. display.

Intensity This is used to set optimum trace intensity depending on ambient lighting conditions.

Focus Used to obtain finest possible trace width.

Scale The un-illuminated graticule is easily visible under normal lighting conditions. Graticule illumination is usually only required under low ambient light conditions or when photographically recording the display. The intensity will depend on the film speed, aperture and exposure time being used. The graticule has 0, 10, 90, 100% lines marked to assist in rise time measurement.

3.3 Y CHANNEL CONTROLS

These controls are grouped beneath the c.r.t. display. The input signal is applied to the CH1 or CH2 BNC input socket.

Coupling

For direct connection of the input signal, set the associated AC-Ground-DC input lever switch to DC.

For capacitive coupling of the input signal through an internal 0.1μF 400V capacitor, set the lever switch to AC.

NOTE:
When examining low amplitude a.c. signals superimposed on a high d.c. level, the lever switch should be set to AC and the sensitivity of the Y amplifier increased.

To locate the baseline, set the lever switch to the 'ground' setting. At this setting, the input signal is open circuit and the input of the amplifier is switched to ground.

Sensitivity

Set the VOLTS/CM switch to a suitable setting. To minimise pick up at sensitive settings, it is essential to ensure that the ground lead connection is near to the signal point.
If necessary, adjust the concentric VARIABLE control.

NOTE:
The range of the VARIABLE control is approximately 3.1 so that its full adjustment overlaps the adjacent lower sensitivity range. Except at the CAL setting, the VARIABLE control is uncalibrated. At the CAL setting, the calibration corresponds to the setting of the VOLTS/CM switch.

Shift

For vertical shift of the trace, adjust the Y shift controls (identified with vertical arrows).

Bal.

The preset balance should be adjusted to minimise verticle movement of the CH1 or CH2 traces when the inputs are grounded and the attenuator switch is moved between the 0.5V/cm position and the 0.2V/cm position: This should only be done after a reasonable warm up time of say 15 minutes and should only require infrequent adjustment thereafter.

Y Mode

This three position switch allows single channel display of the selected channel CH1 or CH2, or dual channel display when CH1 & CH2 is selected.

3.4 TIMEBASE AND TRIGGER

All controls associated with the Timebase and Trigger facilities are grouped together on the right hand side of the panel.

Time/cm, Expand and Shift

The timebase sweep speed (i.e. the time scale of the horizontal axis) is determined by the setting of the TIME/CM switch.

X Expand

The time scale can be adjusted to any intermediate setting by use of the concentric X EXPAND control. This provides a calibrated sensitivity at the X1 and X10 detent positions at the ends of travel with a fully variable uncalibrated range between. The X shift control, identified with horizontal arrows is used to centre the display or locate any part of the trace in the expanded condition. This is a dual action control, providing fine adjustment over a small angle of rotation and coarse adjustment over the full rotation.

Trigger

The TRIGGER SOURCE switch selects one of the four signals, internal CH1, internal CH2, External or line.
The TRIG COUPLING selects wideband DC or AC coupling.
The AC coupling cuts off at approx. 1.5Hz.
The L.F. reject position limits the trigger sensitivity below approx. 15kHz while the HF reject is AC coupled

but limits sensitivity above approx. 34kHz. The source switch also selects the slope, positive or negative going, to cause trigger when the signal passes through the level set by the TRIGGER LEVEL control.
The associated L.E.D. indicates when trigger signals are present. This will flash at low repetition rates and remain on at faster rates. However it may not indicate trigger signals above 5MHz.
In the Normal mode of operation, the timebase will free run automatically in the absence of trigger signals.
This provides a "bright line" display to assist in trace location. With this facility operating, false triggering may occur if the trigger frequency is less than approx. 40Hz. It is disabled in the Refreshed or Roll modes and can be disabled in the Normal Mode by pulling the Trigger Level Knob.

3.5 STORE CONTROLS

All controls associated with the storage facility are grouped together and distinguished with blue coding. The DISPLAY MODE lever switch selects the three modes of operation NORMAL, REFRESHED or ROLL, the associated L.E.D. indicating the operating mode.

Normal

In this mode the instrument operates as a conventional oscilloscope and the store controls do not influence the display. This mode of operation is available for all medium and fast sweep rates, 0.5s/cm to 1μs/cm, but if slower sweep rates are selected, the instrument operates automatically in the Refreshed mode.

Refreshed

If the instrument is displaying a trace in the Normal mode and the mode switch is moved to REFRESHED, the display essentially will be unchanged. However in this mode and in ROLL, the display is generated via the digital signal path and a small amount of step structure may be detected on the trace. This is visible in the form of small vertical steps, less than ½ mm on slow rising or falling traces. Also with the full X 10 expansion fast rising or falling traces will appear as a series of sloping lines (approx. 10/cm in the X direction) rather than as a smooth curve.
The display is triggered as in the Normal mode but in the absence of trigger the previously stored trace is displayed continuously. This has the advantage of providing a flicker-free display of signals with low repetition or trigger rates even if a fast sweep is selected. The display is updated or refreshed by each trigger signal which would cause a sweep of trace in the Normal mode. A further advantage over Normal operation is the availability of very slow sweep rates with continuous flicker-free display of the sweep as it is written or re-written.
The Refreshed mode can be used over the full range of sweep speeds but as the internal sampling rate is limited to 2MHz, the horizontal sample density decreases in proportion from the normal 100/cm when operating at sweep rates above 50μs/cm.

Roll

Selection of this display mode provides a form of free running time-base not found on a conventional oscilloscope. Incoming data is fed continuously to the store so that the display from the store at any instant is a back history of duration determined by the time/cm speed control. As the display is continuously updated from the right, the trace appears to be moving or rolling to the left similar to the view through a 10cm window of a strip chart recorder trace.
This mode of display is most suited to direct display of low frequency signals using comparatively slow sweep speeds.
As with the Refreshed mode, the Roll mode can be used on all sweep speed ranges but with limited horizontal sample density at the faster sweep rates.

Store and Release

These buttons operate in the Refreshed and Roll modes. Operation of the STORE button in the Refreshed mode retains any current sweep or the next full triggered sweep as a stored display, unaffected by subsequent trigger signals. L.E.D. lamps indicate the single shot sequence followed. The Armed lamp shows that the circuitry has been primed by operation of the button. This lamp goes off and the Triggered lamp comes on during a sweep. Finally this indication is replaced by the Stored lamp coming on when the stored sweep is complete. The sequence and resultant display is similar to operation of the single shot facility on a conventional storage oscilloscope after erasing any previous trace. The OS4000 has no need for an erase facility as the entry of new data into the store automatically rejects previous data.
Even in the Stored mode it is possible to use the X EXPAND control with adjustment of the X shift control for detailed examination of any part of the trace.
Subsequent operation of the Store button will repeat the single shot storage cycle, updating the display as required.
Operation of the Release button will return the instrument to the Refreshed mode of operation.

Pre-Trigger Storage

The effect of operation of the STORE button in the ROLL mode depends on the setting of the STORED TRIGGER POINT SWITCH. With this switch in the top (End Trace) position, the rolling trace will continue after operation of the STORE button until a trigger is received when the display will be frozen. Thus it shows a full trace of signal prior to trigger, i.e. trigger is at the end of the trace, not at the beginning as on a conventional oscilloscope, storage type or otherwise.
Operation of the STORE button at the ¾ trace setting of the STORED TRIGGER POINT switch allows the display to roll on for ¼ of a sweep beyond the next trigger. The resultant frozen display shows ¾ of the trace occuring before trigger and ¼ after trigger.
The actual trigger point on the waveform, ¾ from the

left hand side of the screen, is shown by a bright-up spot. It may be necessary to reduce the Intensity setting to obtain contrast to see this spot.
Selection of the ½ or ¼ trace position of the Stored Trigger Point allows the proportion of pre-trigger display on subsequent storage cycles to be varied accordingly.
The ability to display a trace of the incoming waveform prior to or about trigger, can be used up to sweep speeds of 50μs/cm, irrespective of the trigger rate.
For this function, the Roll mode is advantageous on fast changing signals and at fast sweep speeds. These present a meaningless display which in the free running Roll mode but are relevant when stored.
The X EXPAND facility can be used with the X shift control in this Stored mode for detailed examination of any part of the trace. It should be noted that the bright-up dot actually occurs approx. 0.2% of trace before the actual trigger point and this can be seen as a 2mm difference on X 10 expand.
The Armed, Triggered and Stored lamps associated with the STORE button, operate in the Roll mode similarly to that described for Refreshed. At the End Trace setting, the triggered state is omitted as the display is held in the Stored Mode immediately upon receipt of trigger.
After storage, operation of the RELEASE button will return the function to Roll. Alternatively further operation of the STORE button will return the function to Roll but primed for another storage cycle. In either case previously stored data has to roll out of the store as new data is fed in. A new trigger signal will be accepted only when this mixed display condition has cleared.

Lock Full Store

Operation of the LOCK FULL STORE button prevents change of the data held in the store. It can be used usefully in the Roll mode to freeze the display at once if a feature of interest appears on the screen. Alternatively the store can be locked in the Refreshed or Stored modes. Subsequently the instrument can be used as a conventional oscilloscope in the Normal mode but the original locked display is recalled when returned to the Refreshed mode. The Lock Full Store button latches mechanically. To enable the instrument to update the store as usual the button should be pressed again. An LED indication warns that the Lock Full Store or Lock Alternate Samples button is pressed. It should be noted that movement of function switches after a display has been locked in the Roll mode, can disturb the display, particularly shifting the start point of the trace and the bright up trigger marker spot if relevent. This disturbance is not corrected when the function switch is returned to Roll.

Lock Alternate Samples

All the store functions described above operate irrespective of the setting of the 'Y' Mode switch. This is, they apply equally to the single trace display of CH1 or CH2 and the dual trace display of CH1 & CH2. This is not so for the LOCK ALT. SAMPLES button. When this condition is applied in the Refreshed mode for single trace displays (CH1 or CH2), the effect is to produce a dual trace display. One trace is stored and the other free to follow updating signal inputs. This simultaneous display of stored and the incoming signal can be used to compare 'before' and 'now' traces or even to compare traces taken at different sweep speeds, (once a trace is stored its display is not altered by the setting of the Time/cm switch except above 50μs/cm). Operation of the LOCK ALT. SAMPLES in the dual trace, CH1 & CH2, mode has the effect of freezing the CH2 trace, leaving CH1 free to respond to current signals.
It should be noted that it is possible in this condition to see a narrow vertical transient appearing on the CH2 trace at the point where the CH1 trace is being refreshed. This effect can be removed by switching from CH1 and CH2 to CH1 once CH2 has been frozen.
Once the LOCK ALT. SAMPLES button is pressed, it is possible still to go from Refreshed to Store and then to Release to Refreshed with the free trace following the mode selected, but the frozen trace remaining as when that lock button was pressed. Operation of the LOCK ALT. SAMPLES button in the ROLL mode is less meaningful than in the Refreshed mode. Half of the display is frozen as before, giving a dual trace effect to single channel displays or locking CH2 only on dual trace displays. However the trace continues to move across the screen from right to left with data lost from the left appearing at the right.

3.6 ALIAS EFFECTS

In the Refreshed and Roll modes, the instrument uses a sampling system to examine the incoming waveform. Any such system can give misleading results known as alias effects if the input signal has a significant component with a frequency approaching or above the sampling frequency.
Fig. 1 shows the effect of the sampling process on a triangular input waveform (trace A).
Trace B shows the effect of sampling at a frequency close to four times that of the input if the display is formed by a series of dots. It will be seen that this can become a meaningless jumble. However trace C shows the same sampled waveform reconstructed with the dot joining system employed in the OS4000. Thus the display is formed by a series of straight lines, joining the successive sampled levels rather than a dot at each level, usually used on reconstructed displays. The dot joining approach is seen to retain the essential nature of the input waveform without ambiguity. This is particularly important as the horizontal dot density is much closer than that shown on the diagram. However if the sampling rate is reduced further, the essential nature of the waveform will be lost. Trace D shows the effect of a sampling rate close to half the input frequency and Trace E the effect when the frequencies are nearly equal. In the latter case the display appears as the input form but at reduced frequency. The frequency division is the