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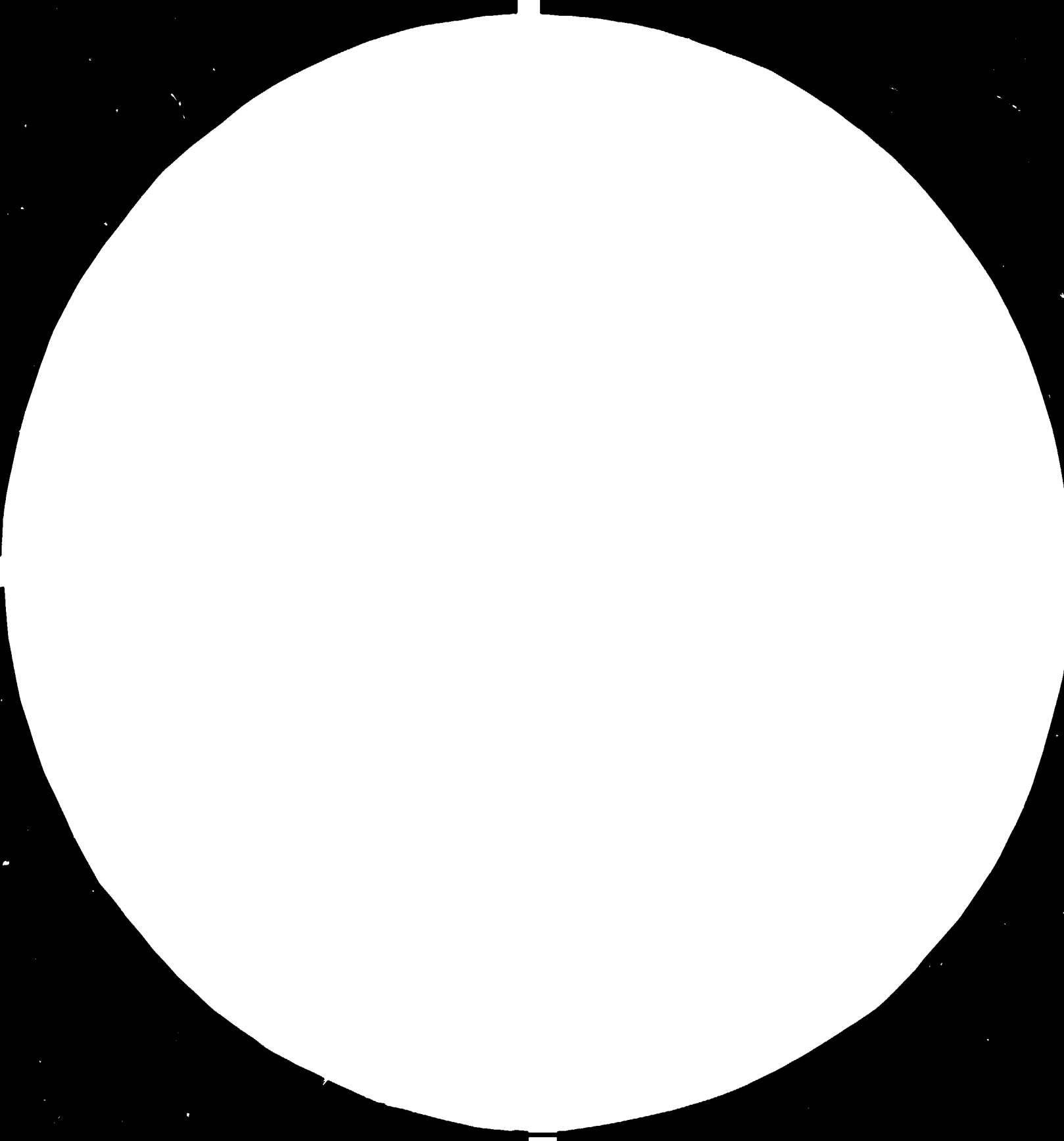

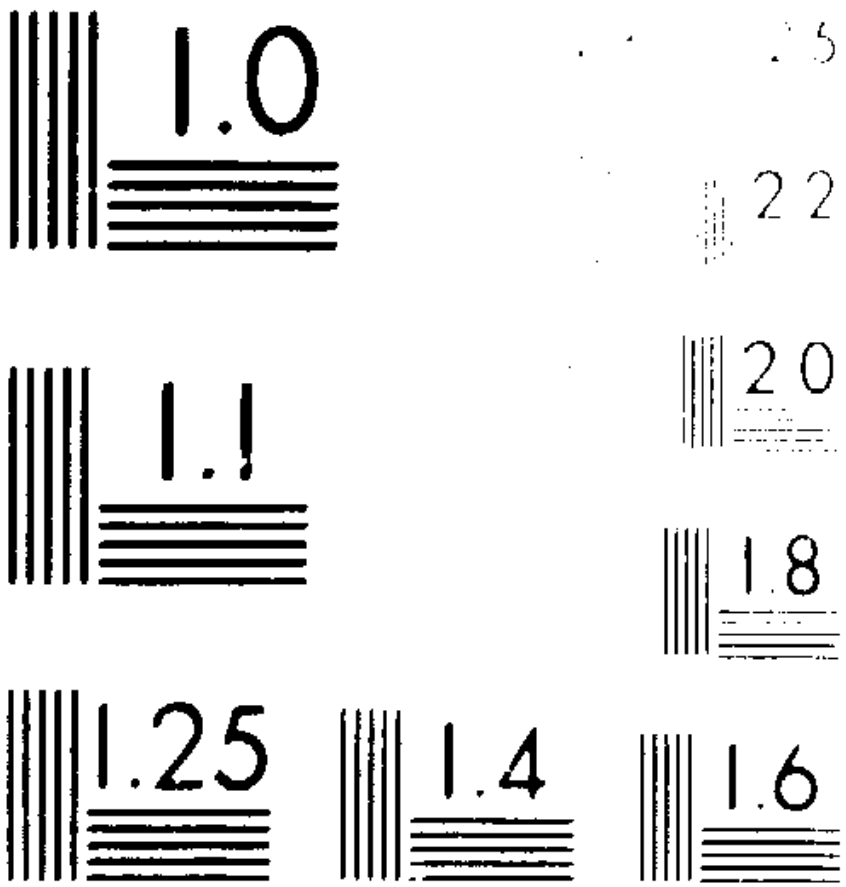
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ASSISTANCE TO THE ELECTRONIC INDUSTRY

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LIBYA

Technical report: Evaluation of tenders for the establishment of a CTV assembly plant

Prepared for the Government of the Socialist People's Libyan Arab Jamahiriya
by the United Nations Industrial Development Organization

Based on the work of Pentti O.A. Haikonen,
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United Nations Industrial Development Organization
Vienna

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CONTENTS

!. SUMMARY

Two tenders for the establishment of a CTV factory in the Socialist People's Libyan Arab Jamahiriya are evaluated.

The evaluated areas are

1) Factory design and layout
2) Production equipment
3) Proposed products
4) Economic appraisal.

It was agreed with Mr. Tulti, Project Manager E.I.P. that the contractual aspects should not to be covered.

Due to temporal limitations in-depth evaluation of all areas has not been possible.

The tenders were submitted by Mirotronic Television GMBH and Philips for production volume of 40 000 sets/a and 80 000 sets/a respectively.

Both tenderers offer similar technology and technically similar product. However the Philips product scheme allows easy adaptation to wide range of screen sizes.

The production equipment prices are comparable.

The Philips kit prices are slightly more attractive.

Should the project be deemed economically or otherwise feasible and one of the tenders accepted, the factory architecture and layout should be reconsidered.

2, FACTORY DESIGN AND LAYOUT

2,1, Mirotronic Television GMBH Tender

The Mirotronic Television GMBH tender is based on the proposed production volume of 40 000 sets/year and the factory hall and assembly lines are dimensioned accordingly. The factory hall consists of one level only.

The factory hall is designed so that the incoming components store is situated in the one end of the building and the finished products store in the other end of the building. In principle this is very advantageous as the material flow may be unidirectional through the building and the incoming goods and finished products warehousing and loading will not disturb each other.

The factory space is indicated in the layout drawing as follows:

Incoming components store	2010 m2
Finished products store	750 m2
Assembly space	1300 m2
Cabinet assembly	640 m2
Offices workshop etc	2200 m2
Total	6900 m2

The needed space for incoming components and finished products can be checked roughly as follows:

Production	40 000 sets/year
	3 500 sets/month

Incoming components store:
Assume monthly supply.
One kit = approx 0,5 m2 with free space and storage racks
Needed space approx 3500x0,5 m2 = 1750 m2
Indicated space 2010 m2 OK.

Finished products store:
Assume monthly delivery.
One TV = 1 m2 with free space
stacking on six levels
Needed space approx 3500 x 1/6 m2 = 583 m2
Indicated space 750 m2 OK.

Considerable space (640 m2) is allocated to the cabinet assembly in the layout drawing. This figure is certainly rather high even if it would also include storage space for assembled cabinets.

The quality control space is missing totally in the layout drawing. Instead an acceptance department (315 m2) is included in the incoming components store area. The purpose of this department is not quite clear. It may be intended for acceptance tests for incoming components, but if it is also intended for finished products quality control, then it is very badly mislocated. Finished products quality control space must be located near the packing area.

The assembly line area is rather crowded and the assembled chassi must be transported by means which are not indicated some 50 meters fron the chassis adjustment line to the final assembly line.

There are two 28 m lines for endurance test (burn-in or soak test). The burn-in must take place before final alignment and final inspection. However, it is not indicated how the endurance test lines are connected to the final alignment line.

The assembly process flowchart is not included in the tender.

2.2, Philips Tender

The Philips tender is based on the proposed production volume of 80 000 sets/year and the factory hall and assembly lines are dimensioned accordingly,

The factory hall is designed so that the incoming components store the finished products store are combined and are located at one end of the building. This is not recommended as the incoming component warehousing and finishedproducts warehousing and their loading operations may conflict each other. The material flow will not be unidirectional either, as can be seen on page 37, book B of the Philips tender.

The factory building consists partly of two levels. The factory space is indicated in the layout drawing, page 25/26 book B and on page 36 book B as follows:

Incoming components store	2400 m2 + 1100 m2 on mezzanine
Finished products store	600 m2 + 500 m2 on mezzanine
Warehouse offices	100 m2 + 100 m2 on mezzanine
Assembly space	2100 m2
Quality control and workshop	450 m2
Offices	910 m2 + 910 m2 first floor
Total approx	6560 m2 + 2610 m2
External Buildings approx	750 m2

The needed space for incoming components and finished products can be checked roughly as follows:

Production	80 000 sets/year
	7 000 sets/month

Incoming components store:
Assume monthly supply .
One kit = approx. 0,5 m2 with free space and storage racks.

Needed space approx	7000 x 0,5 m2 = 3500 m2
The indicated space is	2400 + 1100 = 3500 m2 OK.

Finished products store:
Assume monthly delivery.
One TV = 1 m2 with free space
Stacking on six levels

Needed space approx	7000 x 1/6 m2 = 1167 m2
Indicated space	600 + 500 m2 = 1100 m2 OK.

The assembly process as indicated in the assembly process flowchart (page 21/22 book B) is planned according to good engineering practices with soak test (burn-in) between pre-check and final alignment .

The total lenght of the soak test conveyor is about 80 meters. Thus the soak test conveyor can accommodate about 100 sets maximum. If the production volume is about 300 sets/day (80 000 sets/year) ,
then the average soak test duration will be less than 3 hours. A soak test duration of up to 8 hours would be more desirable.

The quality control room is located near the packing area. However the access to the quality control room is only through a corridor through which the packed sample TV-sets must be transported.
With slight rearrangement of the pantry and quality manager office a direct route between packing area and quality control room could be realized.

The mechanical workshop is located much too far from the production hall. Frequently rather heavy and bulky items must be transferred between the workshop and the assembly lines. In this case this would take place through the corridor. The workshop should not be located near the quality control room or engineering laboratory as the machinery may cause electrical interference.

3. PRODUCTION EQUIPMENT

3.1. General

The production equipment of TV-factory consists of universal equipment and specific equipment.

The universal equipment consists of equipment and machinery which can be used regardless of CTV-models which are being produced. Typical universal equipment are

- Assembly line conveyors
- Soldering machines
- Cutting and bending machines
- Test signal transmitter
- Component insertion machines (if used)
- Certain test equipment
- Workshop machines
- Tools, pneumatic and other
- etc.

The choice of universal equipment depends on the production volume of the factory and on the product generally.

The assembly line conveyor configuration depends on the production process flow.

The choice of the soldering machine depends among other things on the size of the biggest PC-board to be soldered. Nowadays, this is no longer any critical point as the size of the biggest PC-board in a CTV (motherboard or monocarrier) is getting ever smaller. The reliable operation of the soldering machine is very important. If the soldering machine fails, the whole production will stop.

Test signal transmitter and test signal distribution network provides test signals for alignment and inspection purposes along the assembly line. The reliability of this system must be good as a failure may stop the production.

Components can be inserted in the PC-boards manually or by automatic insertion machines.. However, there are certain components that cannot be inserted by machine.

Automatic insertion machines would represent a major investment and as the number of CTV components that could be inserted automatically is goingdown, the automatic insertion on this production volume is less and less advantageous.

Neither of the tenderers are offering automatic component insertion machines.

Specific equipment consists of equipment and jigs which are used for the production of a certain CTV-model only. The specific equipment depends on the product and on the essembly process.
Generally the licensee has to rely on the licensor's lists on specific equipment.

3.2. Mirotronic Television GMBH

Generally all the needed universal equipment seem to be there with spare parts. The indicated quantity of all the equipment cannot be exactly evaluated as the type and manufacturer are not given and their capacity is not known. However the indicated numbers appear plausible.

Few points that should be checked:

- Signal equipment for endurance run 76800 DM. Generally it is not necessary that the sets are connected to an antennasignal during endurance test. However certain new models switch off automatically, if there is no antenna-signal for a certain period of time.

- Amplifier antenna signal 44800 DM. The purpose of this item is not quite clear as the signal transmitter and distribution is mentioned elsewhere.

- Soldering machine 131200 DM, table for soldering machine 1600 DM. Is the soldering machine complete with fluxing unit and preheating section?

- Electrical forklifts a 96000 DM. Two of these are specified for incoming components store and one for delivery store. One forklift should be enough for each of the stores.

Some minor equipment (certain handtools etc) may be missing, but their monetary value is insignificant. However a certain extra sum should be allocated for small handtools and minor items, as these are frequently damaged or lost.

The quantity and choice of test equipment seem to be adequate. Mirotronic is not giving the makes of the equipment, so the quality cannot be evaluated.

Specific equipment is not indicated separately.

Specially it should be noted that mechanical and electrical installation including illumination and lamps are included in the lists for factory equipment. Also office equipment is included.

The pneumatic compressor is only indicated for the styropor factory.

Air conditioning is not included.

3.3 Philips Tender

The lists for universal machinery, equipment and tools are detailed and seem to include all needed items (Book B). Spare parts and spare units are not separately indicated but they are mentioned on page 92, book B (prices and conditions).

The soldering machine is more expensive than in the Mirotronic tender. However, these machines cannot be compared as Mirotronic is not giving any details.

Again a provision should be made for small items which are easily damaged or lost.

Generally Philips test equipment is indicated and the quantity and choice of the equipment seem to be adequate. The electrical performance of Philips test equipment is known to be good. However, on my own experience adequate cooling of the Philips test signal generating and transmitting equipment is very important.

List of specific equipment is given separately in book C.

Mechanical and electrical installation, illumination or lamps are not included in the tender.
Office equipment is not included.

Air conditioning is not included.

4, TECHNICAL EVALUATION OF PROPOSED PRODUCTS

4,1. Mirotronic Television GMBH

Mirotronic is proposing four different products, ie, 20" CTV receivers, types 4304 and 4704 and 27" CTV receivers, types 4704 and 4724.

All these models are based on the same chassis, so-called chassis concept "Compact 2027" This chassis is suitable for screen sizes between 20" and 27".

This chassis is of modern design and the given electrical performance is up to present day standards.

The component count is relatively low and the chassis should be reasonably easy to assemble and align.

From the production point of view it is desirable that all the produced CTV-models are based on the same chassis, This simplifies production and component warehousing.

The Mirotronic " compact 2027 " chassis is not suitable for 14" CTV and as only 14" and 20" CTV production is planned, a different chassis for the 14" CTV model would be needed.

4,2. Philips tender

Philips is proposing three different 20" CTV models, ie 20" standard, semi-deluxe and remote control models.

These models are based on a common so-called CTO chassis. The CTO chassis is suitable for screen sizes between 14" and 20".

This chassis is of recent design and in fact the product will be introduced to the market in 1984. This may be a drawback as possible initial faults in the design may show up only after a considerable number of sets have been produced.

The given electrical performance is up to present day standards.

The component count is relatively low and the chassis should be reasonably easy to assemble and align.

5. ECONOMIC APPRAISAL

5.1. Mirotronic Television GMBH tender

The Mirotronic tender is based on a production volume of 40 000 sets/year. All prices are quoted ex factory. Prices are valid for the whole execution period of the contract. Prices are given in German marks. In the following rate of exchange 1 DM = 0,12120 L.D is used.

Price summary (Mirotronic Television GMBH tender)

Item	cost DM	cost L.D
Factory equipment (Item 1-6.4,11 of Mirotronic price summary)	6051335,-	733422,-
Installation and start-up	915200,-	110922,-
Assistance	3088800,-	374363,-
SUB TOTAL	10055335,-	1218707,-
Office equipment	209976,-	25449,-
P.T.T, equipment	106881,-	12954,-
Styropor factory	1462795,-	177291,-
Training room	104730,-	12693,-
Documentation equipment	21515,-	2608,-
Training in S.P,L.A.J.	768000,-	93082,-
Know-how documentation	420000,-	50904,-
TOTAL	13149232,-	1593688,-

Note. Factory equipment contains mechanical and electrical installation including illumination.

Kit prices:

Price is quoted ex factory, 20" CTV price is based on quantity of 30 000 set/year. Kit includes cabinet.

Item	DM	L.D.
CKD chassis	531,-	
Mounting kit	451,-	
Process material	14,80	
Total	996,80	120,81

5.2. Philips tender

The Philips tender is based on a production volume of 80 000 sets/year. All prices are quoted C and F Tripoli . Equipment prices are valid till 31 Dec. 1985.
The following rate of exchange is used; 1 DFL = 0,10768 L.D.

Price Summary

Item	cost DFL	cost L.D.
Universal equipment	5443753,-	
Spares	275000,-	
Subtotal	5718753,-	615795,-
Specific equipment IA,IB	588647,-	
Spares	30000,-	
Subtotal	618647,-	66616,-
Specific equipment II	1447890,-	
Spares	75000,-	
Subtotal	1522890,-	166985,-
Factory equipment total	7860290,-	846396,-
Installation and start-up	1030000,-	110910,-
		+ 49400,-
Assistance	2100000,-	226128,-
		+ 173400,-
TOTAL	DM 10990290,-	1183434,-
	+ L.D. 222800,-	+ 222800,-
		1406234,-

Kit prices:

Prices are quoted C and F Tripoli. Prices are valid till 31 Dec.1983. After that prices will be reviewed.

An industrial fee of DFL 50,- will be charged per kit up to 40 000 kits/year and thereafter DFL 25,- .
At the production volume of 80 000 sets/year (phase II B) the fee averages DFL 37,5 per kit.

20 CT 6070 standard:

Phase	Price DFL	Price L.D
SKD IA	990+50	111,99
SKD IB	865+50	98,53
CKD IIA	820+50	93,68
CKD IIB	790+37,5	89,11

The kits contain certain items as follows:

	I A	I B	II A	II B
Packing material	YES	NO	NO	NO
Instruction manual	NO	NO	NO	NO
Cabinet	YES	NO	NO	NO
Cabinet kit	NO	YES	YES	NO
Emblem	NO	NC	NO	NO

5.3. Comparison of tenders

Item	Mirotronic	Philips
Factory equipment	L.D. 733422,-	L.D. 846396,-
Installation and start-up	L.D. 110922,-	L.D. 160310,-
Assistance	L.D. 374363,-	L.D. 399528,-
20" kit (incl. cabinet)	L.D. 120,81	L.D. 111,99

The Mirotronic factory equipment price is quoted ex factory and Philips C and F Tripoli . Philips equipment is for a capacity of 80 000 sets/year against the Mirotronic capacity 40 000 sets/ year.

Mirotronic kit price is ex factory, Philips kit price is C and F Tripoli . On the other hand Philips kit price may rise after 31 Dec. 1983

6. CONCLUSIONS

Both tenderers, Mirotronic Television GMBH and Philips , are offering similar production technology and technically similar products.

The proposed capacity for the Mirotronic factory is 40 000 sets/year and for the Philips factory 80 000 sets/year.

On this scale not very much more production equipment is needed to boost the production from 40 000 to 80 000 sets/ year. For instance one properly chosen soldering machine has enough capacity for the production volume of 80 000 sets/year.

The Mirotronic factory layout facilitates unidirectional material flow and the storage space is adequate for the indicated production volume. Otherwise the layout should be carefully reconsidered.

Unidirectional material flow is not possible in the Philips layout. The factory building proposal by Inter-Engineering BV is quite detailed and contains the main points reasonably. However the location of quality control and workshops should be reconsidered. Also the mezzanine store could be discussed.

The production equipment is in both tenders quite similar. However Mirotronic tender includes mechanical and electrical installations (obviously material, installation work is quoted elsewhere), illumination and lamps, office equipment etc, which is not covered by Philips tender. The value of the mechanical and electrical installation is about DM 500 000,-.

The proposed products are technically quite similar. However the Philips product scheme is more attractive as the whole range of screen sizes from 14" to 26" can be realized.

The Philips kit prices are also lower, but they may be reviewed annually whereas the Hirotronic kit prices are valid for the whole period of the contract.

In the long run the kit prices determine the economical outcome of the project.
If the kit prices are not distinctively lower than the prices of the similar complete sets available, it will be very difficult to recover the initial investment in terms of foreign currency and to make any currency savings.

If the Government of the S.P.L.A.J. decides to proceed with the project, further assistance by UNDP should be considered.