BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR IMPROVEMENT
OF THE RUPAVAHINI NATIONAL CHANNEL
IN
DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

MARCH 1997

Japan International Cooperation Agency
NHK Integrated Technology Inc.

MINISTRY OF MEDIA, TOURISM AND AVIATION
DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

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Preface

In response to a request from the Government of Democratic Socialist Republic of Sri Lanka, the Government of Japan decided to conduct a basic design study on the Project for Imorovement of the Rupavahini National Channel and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Sri Lanka a study team from November 12 to December 15, 1996.

The team held discussions with the officials concerned of the Government of Sri Lanka, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Sri Lanka in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Democratic Socialist Republic of Sri Lanka for their close cooperation extended to the teams.

March 1997

Kimio Fujita
President
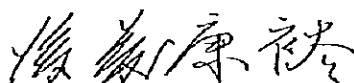Japan International Cooperation Agency

March 1997

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Improvement of the Rupavahini National Channel in Democratic Socialist Repblic of Sri Lanka.

This study was conducted by NHK Integrated Technology Inc., under a contract to JICA, during the period from October 15, 1996 to March 31, 1997. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Sri Lanka and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that report will contribute to further promotion of the project.

Very truly yours,

Yasuhiro GOTOH
Project Manager,
Basic Design Study Team
on the Project for Improvement of
the Rupavahini National Channel
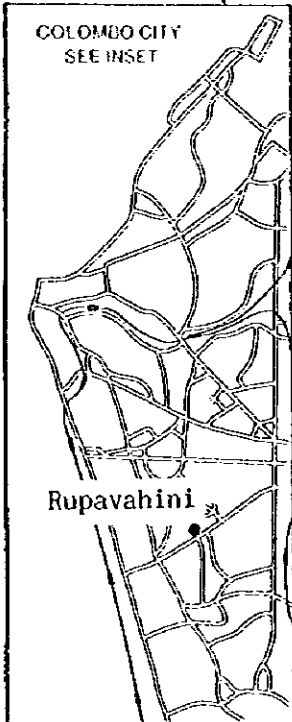NHK Integrated Technology Inc.

Sri Lanka

40 km / 25 miles

Legend:
— Park Boundary
⋯⋯ Railway
— · — · Main Road
⋯⋯⋯ Trunc Road
● Village / Place Name

Bay of Bengal

COLOMBO CITY SEE INSET

Rupavahini

Studio Complex at Colombo

Primrose Hill Transposer Station

Pidurutalagala Transmitting Station

WILPATTU NATIONAL PARK

WADURU OYA N.P.

GAL OYA N.P.

YALA EAST N.P.

RUHUNA N.P.

UDA WALAWE N.P.

Indian Ocean

Hantana Transposer Station
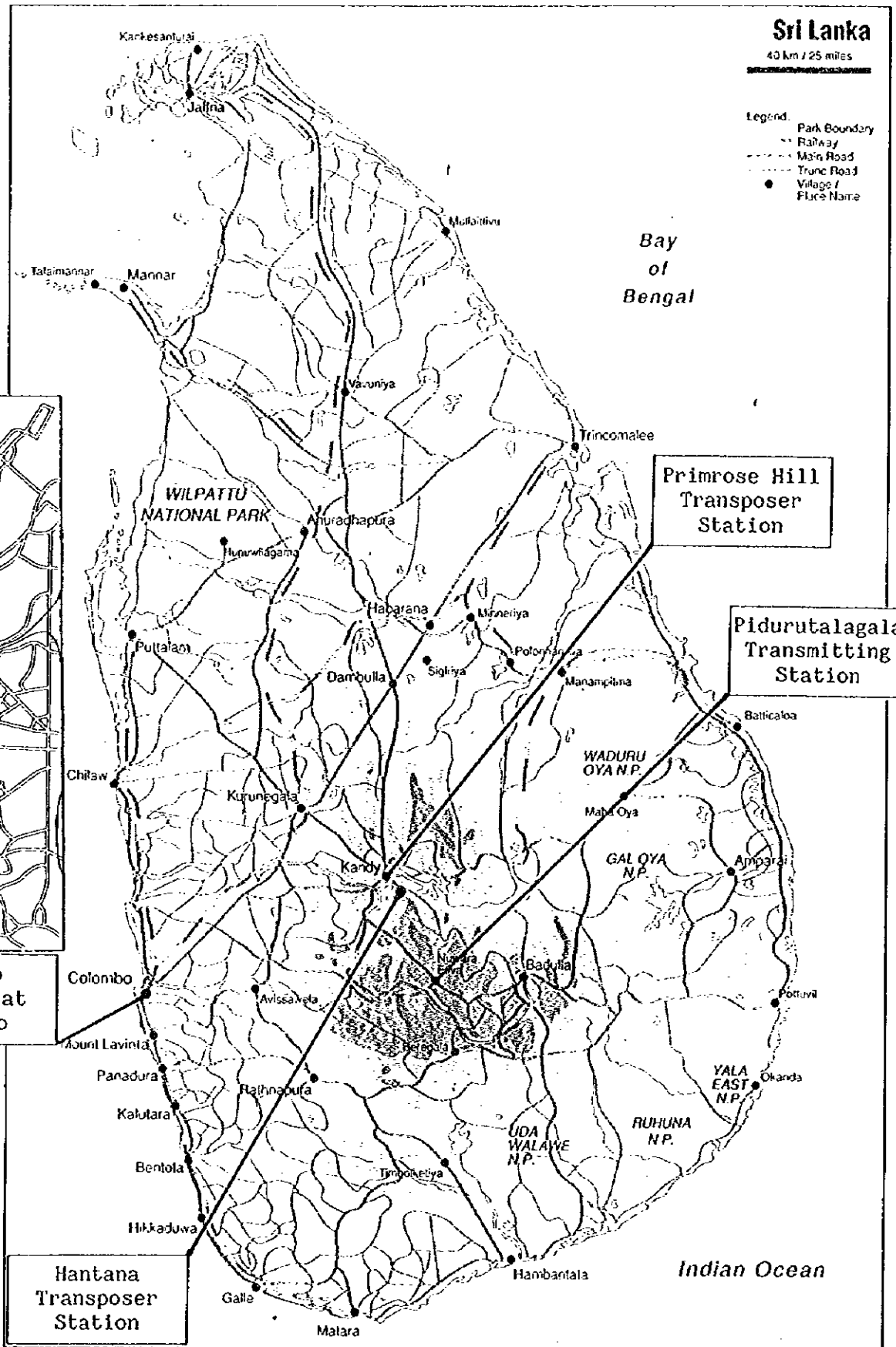
Site Map of the Project

Abbreviation

Item	Meaning
A-B Roll Editing	In this form of editing, two or more reproduction VTR are used to successively convert two or more video sources. When this is combined with digital special effect equipment, etc., A-B roll editing can no longer be simply described as a form of editing but is a technique that makes it possible to pursue visual expression and creation in the editing process.
A/C	Air Conditioner
ACR	[Audio Cassette Recorder] This VCR-related term refers to an audio recorder that uses cassettes.
ADP	[Audio Disc Player] An audio player that uses discs
AM	[Amplitude Modulation] A type of modulation used in transmitters
ATR	[Audio Tape Recorder] An audio recorder that uses open reel tapes
BTSC	[Broadcast Television System Committee] The name of a multi-sound TV system in the United States of America
CCD	[Charge Coupled Devices] Picture shooting elements used in solid-state cameras
CCIR	Consultative Committee for International Radio
CCU	Camera Control Unit
CD	Compact Disc
CG	[Computer Graphics] The technology whereby computers are used to draw diagrams, or the images that are obtained by means of this technology.
CIN	[Constant Impedance Notch diplexer] A vision-sound output mixer
CPU	[Central Processing Unit] The mind of a computer, this performs memory, control and accumulation
DG, DP	[Differential Gain] A standard relating to distortion in color pictures [Differential Phase] A standard relating to hue in color pictures
DT	[Dynamic Tracking] This refers to the slow playback function of a VCR

Item	Meaning
DVE	[Digital Video Effect] This enables two-dimensional effects and special effects, i.e. the transfer, reduction and expansion, etc. of mosaic pictures, to be achieved. Advanced models make it possible to achieve three-dimensional effects, for example, screen rotation and perspective, etc.
ENG	[Electronic News Gathering] A news gathering system that uses portable visual instruments
ETC	[Extra Terrestrial Vision] A private television broadcasting station in Sri Lanka
FM	[Frequency Modulation] A type of modulation used in transmitters
FPU	[Field Pick-Up Unit] An outside microwave relay device used to transmit sound and pictures from sports stadiums, etc. to the Broadcasting Center
FSS	[Flying Spot Scanner] A device used to show photograph images or diagrams, etc. one at a time during television programs
GPS	[Global Positioning System] This system which uses four satellites to measure one position allows three-dimensional positioning (longitude, latitude and altitude) to be performed.
ITN	[Independent Television Network] A public service television station in Sri Lanka
LITTE	[the Liberation Tigers of Tamil Ealam] A Tamil extremist organization seeking to establish and independent Tamil state
MTV	[Maharaja Television] A private television broadcasting station in Sri Lanka
NTSC	[National Television System Committee] The name of a color TV system in the United States of America
NICAM	An acronym referring to the unified European standard for the multiplex system. This multi-sound TV system was developed in the United Kingdom.
OB-Van	Outside Broadcast Van
PAL	[Phase Alteration by Line] A color TV system that was developed in the former West Germany
QPSK	[Quadrature Phase Shift Keying] A type of digital modulation system
RF	[Radio Frequency] A term that refers to high frequencies (carrier frequency, etc.) emitted from a transmitter
Rx	Receiver

Item	Meaning
SAW filter	[Surface Acoustic Wave] A filter that utilizes surface acoustic waves, this possesses a sudden characteristic of amplitude and a uniform characteristic of delay time.
SLBC	[Sri Lanka Broadcasting Corporation] The state radio broadcasting corporation of Sri Lanka
SLRC	[Sri Lanka Rupavahini Corporation] The state television broadcasting corporation of Sri Lanka
SLTTI	Sri Lanka Television Training Institute
S/N	[Signal-to-Noise Ratio] The power or voltage ratio of signal to noise. The larger the ratio becomes, the less is the noise interference.
STL	[Studio-to-Transmitter Link] A microwave system of program transmission between a studio and a transmitting station
TBC	[Time Base Corrector] A device used to correct the stability of video signals
TNL	[Telshan Network Limited] A private television broadcasting station in Sri Lanka
TVRO	[Television Receiver Only] An exclusive receiving station used for satellite television
Tx	Transmitter
U-Link	[U-type Link] A connector tube in a television transmitter output coaxial circuit
UPS	[Uninterrupted Power Supply] A system in which battery power is immediately switched to in cases of power cuts. This prevents broadcasting equipment being affected by power cuts.
VCR	[Video Cassette Recorder] A VTR device that uses cassette tapes
VE	Video Engineer
VE Monitor	[Monitor for Video Engineer] A monitor that electrically adjusts video signals taken by television cameras and thus allows the video engineer to secure good picture quality at all times
VHF	[Very High Frequency] A frequency band used in television and FM broadcasting
VTR	Video Tape Recorder
2MK	Mixing Keyer The 2 means that there are two mixing amplifier. One mixing amplifier consists of standard 2 input and 1 keying input. Also known as 2ME (Mixing Effecter)
3D	[3-Dimension] Compared to a flat two-dimensional image, a three-dimensional image shows depth and perspective.

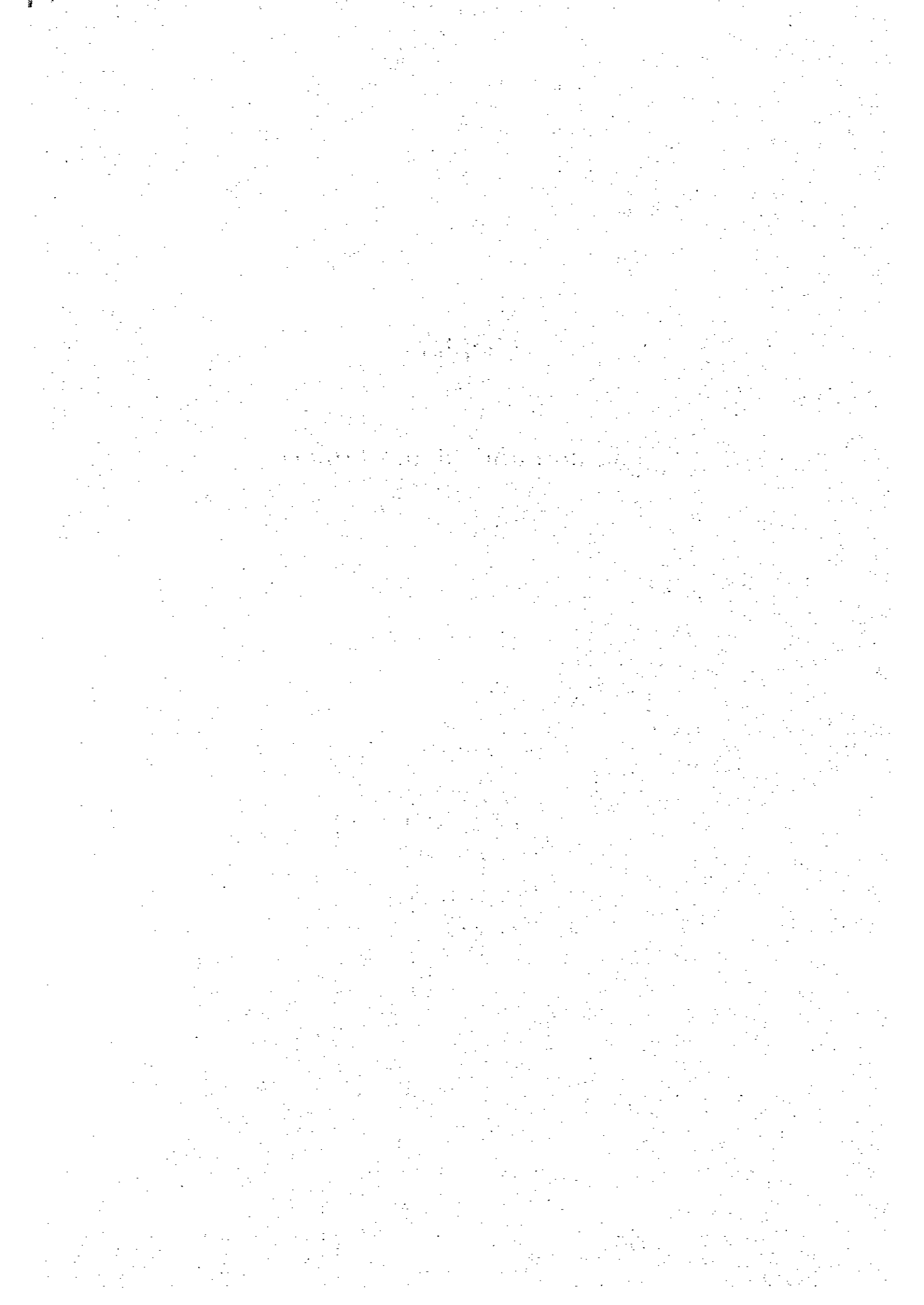| Item	Meaning
4D Antenna	[4-Dipole Antenna] A type of television broadcasting antenna in which dipole antennas are aligned in four stages on a single panel face. High antenna gains in a feature.
4:2:2 System	An international standard for digital component signals. 4:2:2 refers to the ratio between the luminance signal, color-difference signal and sampling frequency.

Contents

Appendices

Chapter 1

Background of the Project

Chapter 1   Background of the Project

1-1   Historical Background of the Request

Sri Lanka (formerly Ceylon) achieved independence in 1948 when it became a self-governing dominion of the British commonwealth.   It achieved full independence in August 1978 when it parted from the British commonwealth and became the Democratic Socialist Republic of Sri Lanka.   The population of Sri Lanka consists of 74% Sinhalese, 18% Tamils and 8% other races, and the racial conflict between the majority Sinhalese and minority Tamils is the single greatest internal issue that confronts the country.   This racial conflict was sparked off by the legal designation of the Sinhala language as the sole official language of the country in 1956.   Tamil youths protesting this policy of preferential treatment for Sinhalese started the armed Tamil Ilam (Tamil state) movement of independence soon after this. The Tamil language came to be recognized as an official language together with Sinhala following the constitutional reform of 1988, however, the racial conflict still continues unabated today.

The basic facilities of Sri Lanka Rupavahini Corporation (SLRC) were constructed through two projects carried out under the Grant Aid Scheme of the Government of Japan: the Project Television Broadcasting Network Construction (1979 and 1980) and the Extension Project of the Additional TV Studio for Educational Program (1984).   As a result of its unparalleled information transmission capacity *the ability to instantaneously and simultaneously transmit information over a wide area), television broadcasting has an extremely large influence on the Sri Lankan people.   As has already been described, the population of Sri Lanka consists of numerous races each possessing their own unique language and culture, and so on, and there is also great variety in terms of religion, as can be inferred from the fact that there are many Hindus, Buddhists, Moslems and Christians, etc. to be found among the Sri Lanka People.   As a result, television broadcasting plays an important role in encouraging mutual understanding among people and promoting harmony between races by introducing the unique cultures, etc. of each race and spreading different religious beliefs.
Despite the importance of television broadcasting, the facilities and equipment that were provided through Japan's Grant Aid in the past are now more than 17 years' old, which means that deterioration is severe and

breakdowns very frequent. SLRC has carried out some replacement of equipment on a small scale through its own efforts, however, the grades of the equipment it can afford are low, meaning that it is currently not in a position to provide programs that are of te quality to satisfy the needs of the Sri Lankan people with respect to broadcasting.

It was in consideration of these circumstances that the Government of Sri Lanka requested the Government of Japan to provide grant aid support for ① the rehabilitation and upgrading of program production equipment at SLRC for expanding and enhancing cultural and educational programs and enhancing broadcasts of Sinhala/Tamil language programs (multi-language broadcasts) to contribute to the resolution of the aforementioned racial conflict, and ② the renewal and new installation of transmitting and studio equipment in order to ensure the maintenance of stable transmitting functions.

1-2 Outline of the Request

The request made by the Government of Sri Lanka concerns ① the rehabilitation and upgrading of program production equipment at SLRC (the implementing agency in the Project) for expanding and enhancing cultural and educational programs and enhancing broadcasts of Sinhala/Tamil language programs (multi-language broadcasts) to contribute to the resolution of the aforementioned racial conflict, and ② the renewal and new installation of transmitting and studio equipment in order to ensure the maintenance of stable transmitting functions. Consequently, the Project is classed as an equipment and materials supply project. The equipment and materials requested by the Government of Sri Lanka are listed in Table 1-2-1.

Table 1-2-1 Equipment List for Japan's Grant Aid by Sri Lanka Side

Item	Description	Quantity
1.	TV TRANSMITTER (Mt. Pidurutalagala Station) Comprising:	
1-1	VHF 10kW TV Transmitter	1 set
1-2 1-2-1 1-2-2 1-2-3 1-2-4	Output Coaxial Equipment Test Load Coaxial Equipment Power Divider Indoor Coaxial Feeder	1 set
1-3	Programme Input and Monitoring Equipment	1 set
1-4	Parallel Operating Equipment	1 set
1-5	AVR & PDB	1 set
1-6	Spare Unit	1 set
1-7 1-7-1 1-7-2	150kVA Engine Generator 150kVA Diesel Engine Generator with Generator Panel Low Voltage Switchgear with Automatic Transfer Switch	1 set
1-8	TV Transmitting Antenna and main Feeder	Existing to be used
2.	TV TRANSPOSER (Primrose Hill Station) Comprising:	1 set
2-1	VHF 100W TV Transposer (Stand-by System)	1 set
2-2	Spare Parts	1 set
2-3	Air Monitor	1 set
2-4	Transmitting Antenna	Existing to be used
3.	TV TRANSPOSER (Hantana Station) Comprising:	1 set
3-1	VHF 1kW TV Transposer (Stand-by System)	1 set
3-2	Spare Parts	1 set
3-3	Air Monitor	1 set
3-4	Transmitting Antenna	1 set
3-5	Receiving Antenna	1 set
4.	7GHz TV STL SYSTEM Comprising:	1 set
4-1	7GHz 10W STL TX	1 set
4-2	7GHz STL RX	1 set
4-3	Spare Parts	1 set
5.	MEASURING EQUIPMENT for TRANSMITTER Comprising:	1 set
5-1	Video Signal Generator	1 set

Item	Description	Quantity
5-2	Frequency Counter (1,000 MHz)	1 set
5-3	Sweep Generator	1 set
5-4	Oscilloscope (100 MHz)	1 set
5-5	Spectrum Analyzer	1 set
5-6	Step Attenuator	1 set
5-7	Audio Distortion Meter	1 set
5-8	Measuring Receiver with Antenna	1 set
5-9	Envelope Delay	1 set
5-10	FM linear Detector	1 set
5-11	RF detector (0.01 to 26.5 GHz)	1 set
5-12	RF push Buttom Attenuator	1 set
5-13	RF Network Analyzer	1 set
5-14	Test Cable	1 set
5-15	Electric Voltmeter	1 set
5-16	Coaxial Reducer	1 set
5-17	DG-DP Measuring Instrument	1 set
5-18	Circuit Tester	1 set
5-19	AM Sideband Analyzer	1 set
6.	NEWS STUDIO	1 set
6-1	Color Camera Chain 　　Comprising:	1 set
6-1-1	Compact CCD Camera	3 sets
6-1-2	Triaxial Camera Adapter	3 sets
6-1-3	Zoom Lens	3 sets
6-1-4	Pedestal	3 sets
6-1-5	Prompter	1 set
6-1-6	Camera Console	1 set
6-2	Lighting System 　　Comprising:	1 set
6-2-1	30kW Control	1 set
6-2-2	Flood Light	1 set
6-2-3	Spot Light	1 set
6-2-4	Monitor	1 set
6-3	Video Equipment 　　Comprising:	1 set
6-3-1	Digital Production Switcher	1 set
6-3-2	Character Generator (Tri-lingual)	1 set
6-3-3	1/2-inch Digital VCR	3 sets
6-3-4	Non-linear Editing Equipment	1 set
6-3-5	Frame Synchronizer	2 sets
6-3-6	Digital Video Distribution Amplifier	1 lot
6-3-7	PAL to 4:2:2 Converter	1 lot
6-3-8	Video Jack Panel	1 lot
6-3-9	System Rack	3 sets

Item	Description	Quantity
6-4	Audio Equipment	1 set
	Comprising:	
6-4-1	Digital Audio Mixer	1 set
	(Analogue 24-inputs, Digital 16-inputs)	
6-4-2	Digital Audio Tape Recorder	1 set
6-4-3	Compact Disk Player	2 sets
6-4-4	Open Reel Tape Recorder	1 set
6-4-5	Cassette Tape Recorder	1 set
6-4-6	Telephone Hybrid	1 set
6-4-7	Digital Audio Distribution Amplifier	1 lot
6-4-8	Audio Jack Panel	1 lot
6-5	Studio Equipment	1 set
	Comprising:	
6-5-1	Floor Microphones	8 sets
6-5-2	Wireless Microphones	1 set
6-5-3	Color Monitor	2 sets
6-5-4	Speaker with Amplifier	1 set
6-5-5	Connection Box	1 set
6-6	Monitoring Equipment	1 set
	Comprising:	
6-6-1	VE Monitor	2 sets
6-6-2	Digital Waveform Monitor	1 set
6-6-3	Audio Monitor	1 set
6-6-4	9-inch Input Color Monitor	16 sets
6-6-5	21inch Color Monitor	2 sets
6-6-6	Air Monitor	1 set
6-6-7	On Air Tally Logic	1 set
6-6-8	Audio Speaker with Amplifier	1 set
6-6-9	Monitor Shelf	1 set
6-7	Sync Signal Equipment	1 set
	Comprising:	
6-7-1	Sync Signal Generator	1 set
6-7-2	Video Distribution Amplifier	1 set
6-7-3	48kHz Distribution Amplifier	1 set
6-8	Power Distribution Board	1 set
7.	POST PRODUCTION	1 set
7-1	Digital Production Switcher	1 set
7-2	Digital Video Effect	1 set
7-3	Digital Audio Mixer	1 set
7-4	Editing Control Unit with Display	1 set
7-5	1/2-inch VCR	1 set
	Comprising:	
7-5-1	1/2-inch Digital Video Cassette Player	3 sets
7-5-2	1/2-inch Digital Video Cassette Player and Recorder	1 set
7-5-3	Color Monitor	2 sets
7-5-4	Speaker with Amplifier	1 set
7-6	Character Generator (Tri-lingual)	1 set
7-7	Computer Graphics and Animator	1 set
7-8	Power Distribution Board	1 set

Item	Description	Quantity
8.	MASTER CONTROL ROOM EQUIPMENT	1 set
8-1	Digital Master Switcher	1 set
8-2	Auto Programming Control System	1 set
8-3	Routing Switcher Comprising:	1 set
8-3-1	32×32 Digital Video Routing Switcher	1 set
8-3-2	32×32 Digital Audio Routing Switcher	1 set
8-3-3	Control Unit	1 set
8-3-4	Remote Control Panel	3 sets
8-4	Video Equipment Comprising:	1 set
8-4-1	Character Generator (Tri-lingual)	1 set
8-4-2	Time Generator	1 set
8-4-3	Logo Generator	1 set
8-4-4	Caption Scanner	1 set
8-4-5	1/2-inch Digital VCR Player and Recorder	2 sets
8-4-6	Frame Synchronizer	2 sets
8-4-7	Digital Video Distribution Amplifier	1 lot
8-4-8	PAL to 4:2:2 Converter	1 lot
8-4-9	4:2:2 to PAL Converter	1 lot
8-4-10	Video Inserter	2 sets
8-4-11	Video Jack Panel	1 lot
8-4-12	System Rack	3 sets
8-5	Audio Equipment Comprising:	1 set
8-5-1	Digital Audio Tape Recorder	1 set
8-5-2	Compact Disk Player	2 sets
8-5-3	Cassette Tape Recorder	1 set
8-5-4	A/D Converter	1 lot
8-5-5	D/A Converter	1 lot
8-5-6	Digital Audio Distribution Amplifier	1 lot
8-5-7	Audio Limitter	2 sets
8-5-8	Audio Jack Panel	1 lot
8-6	Monitoring Equipment Comprising:	1 set
8-6-1	VE Monitor	2 sets
8-6-2	Digital Waveform Monitor	2 sets
8-6-3	Audio Monitor	1 set
8-6-4	9-inch Input Color Monitor	17 sets
8-6-5	21-inch Color Monitor	2 sets
8-6-6	Air Monitor	1 set
8-6-7	On Air Tally Logic	1 set
8-6-8	Audio Speaker with Amplifier	2 sets
8-6-9	Air Distributor with Antenna	1 set
8-6-10	Monitor Shelf	1 set
8-7	Sync Signal Equipment Comprising:	1 set
8-7-1	Sync Signal Generator	2 sets
8-7-2	Auto Changeover Unit	1 set
8-7-3	Video Distribution Amplifier	1 set
8-7-4	Test Signal Generator	1 set
8-7-5	48kHz Audio Signal Generator	1 set
8-7-6	48kHz Distribution Amplifier	1 set

Item	Description	Quantity
8-8	Intercome System	1 set
8-9	UPS (30kVA)	1 set
8-10	Power Distribution Board	1 set
9.	OB VAN	1 set
9-1	Color Camera Chain Comprising:	1 set
9-1-1	Compact CCD Camera	6 sets
9-1-2	Triax Camera Adapter	6 sets
9-1-3	Zoom Lens	6 sets
9-1-4	Tripod Dolly	6 sets
9-2	Video Equipment Comprising:	1 set
9-2-1	Analogue Video Switcher	1 set
9-2-2	Digital Video Effect	1 set
9-2-3	Character Generator (Tri-lingual)	1 set
9-2-4	Digital Still Store	1 set
9-2-5	Video Distribution Amplifier	1 set
9-2-6	Video Jack Panel	1 set
9-3	Audio Mixer Comprising:	1 set
9-3-1	Analogue Audio Mixer	1 set
9-3-2	Audio Distribution Amplifier	1 set
9-3-3	Audio Jack Panel	1 lot
9-4	Monitoring Equipment Comprising:	1 set
9-4-1	9-inch Color Monitor	8 sets
9-4-2	Waveform Monitor	1 set
9-4-3	Vectorscope	1 set
9-4-4	Air Monitor with Antenna	1 set
9-4-5	monitor Speaker	1 set
9-4-6	Sync Signal Generator	1 set
9-5	Microphone	6 sets
9-6	Video and Audio Mixer Comprising:	1 set
9-6-1	1/2-inch VCR	2 sets
9-6-2	Cassette Tape Recorder	1 set
9-7	FPU System Comprising:	1 set
9-7-1	Transmitter	1 set
9-7-2	Receiver	1 set
9-7-3	Parabolic Antenna	2 sets
9-8	Wireless Communication System	1 set
9-9	Vehicle Comprising:	1 set
9-9-1	Vehicle	1 set
9-9-2	Engine Generator	1 set
9-9-3	Air Conditioner	1 set
9-9-4	System Rack	1 set
9-9-5	AVR	1 set

| Item	Description	Quantity
10.	MEASURING EQUIPMENT for STUDIO SYSTEM Comprising:	1 set
10-1	Oscilloscope (100MHz)	1 set
10-2	Digital Video Measurement Set	1 set
10-3	Digital Audio Measurement Set	1 set
10-4	Digital Video Waveform Monitor	1 set
10-5	Audio Distortion Meter	1 set
11.	THREE-CHIP TYPE CCD CAMERA Comprising:	10 sets
12.	1/2-INCH VCR Comprising:	14 sets

Chapter 2

Contents of the Project
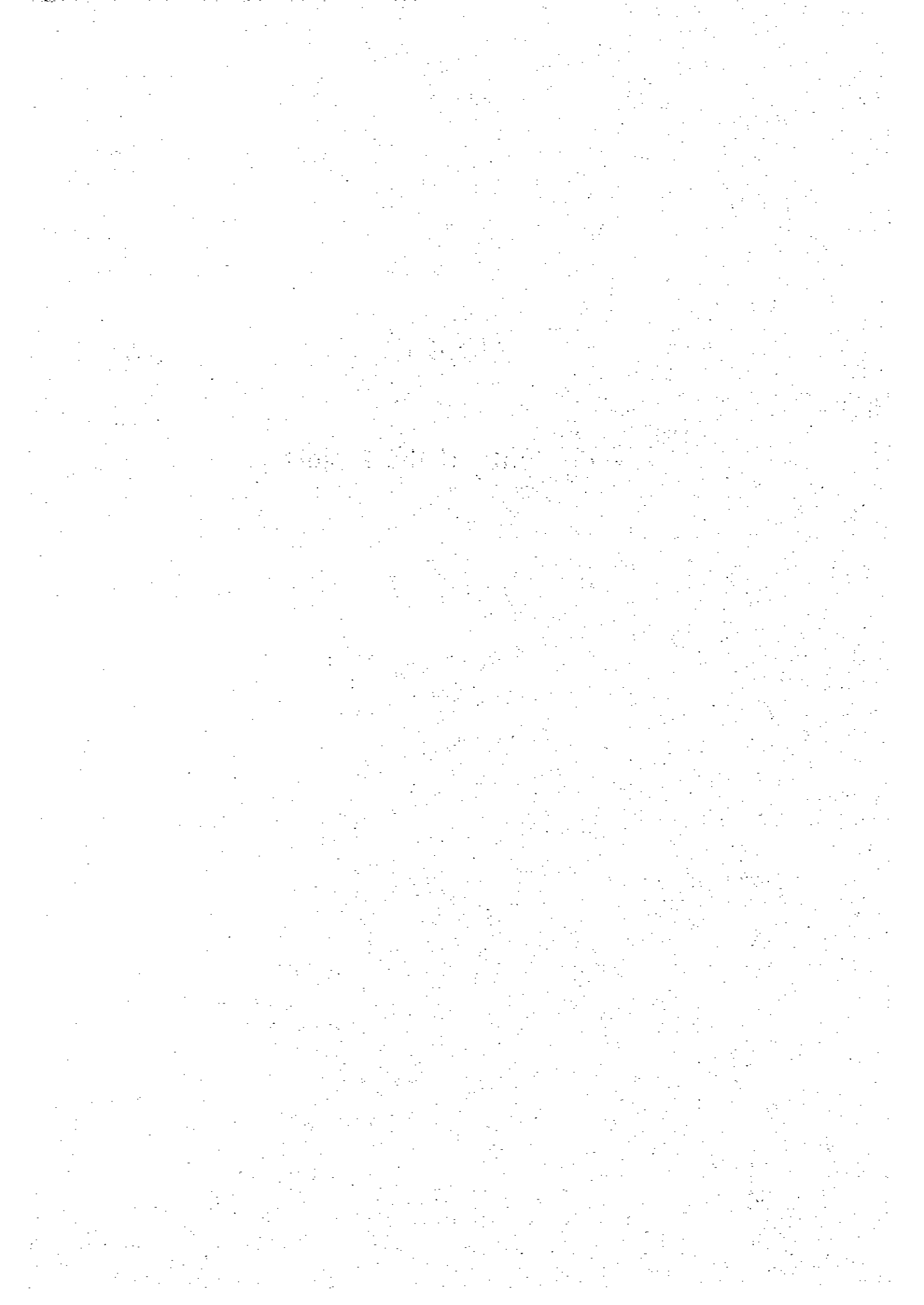
Chapter 2 Contents of the Project

2-1 Objectives of the Project

The basic facilities of Sri Lanka Rupavahini Corporation (SLRC) were constructed through two projects carried out under the Grant Aid from the Government of Japan.   Two projects were the Project for Television Broadcasting Network Construction (1982) and the Extension Project of the Additional TV Studio for Educational Program (1984).

The people of Sri Lanka consists of numerous races (Sinhalese and Tamils, etc.) each race having their own language and culture, and so on. There is also great variety in terms of religion, with Hindus, Buddhists, Moslems and Christians, etc.   In these circumstances, television broadcasting plays an important role in encouraging mutual understanding among people and promoting harmony between races by introducing their cultures and spreading different religious beliefs.

However, the equipment and facilities that were provided by Japan through the above-mentioned first project have been in use for 15 years and the existing equipment at SLRC is in a badly deteriorated state.   Studio equipment is used longer hours than that of original design at Colombo Broadcasting Center and the deterioration of transmitting equipment means that it is impossible to carry out stable transmitting. Although SLRC buys replacement equipment on a small scale with its own funds, it is currently unable to enhance and enrich broadcasting contents and thus unable to respond to the needs of the Sri Lankan people with respect to receiving attractive programs.

It was in these circumstances that the Government of Sri Lanka requested the Government of Japan for Grant Aid assistance for the rehabilitation and upgrading of deteriorated existing equipment at SLRC with the objectives of achieving the enhancement of television programs in the Sinhala and Tamil languages (multi-language broadcasts, etc.), the maintenance of stable transmitting functions, the resolution of poor reception areas, and the introduction of fully digitized systems for broadcasting equipment, and so on.

The objective of the Project is to improve the TV broadcast facilities and enhance the program production as support by the Government of Japan for future broadcasting plans in Sri Lanka.

2-2 Basic Concept of the Project

2-2-1 Contents of the Request and Result of Examination

The request presented by Sri Lanka Rupavahini Corporation (SLRC) covered a wide range of items from the renewal of program production, sending-out, and transmitting equipment to resolution of the poor reception area at the Kandy city and introduction of Sinhala and Tamil language simultaneous broadcasting (multi-language broadcasting), etc.

The study team paid attention to the following points when compiling the basic concept of the Project based on the results of the survey and discussions with the SLRC side.

① The broadcasting equipment to be renewed under the Project shall be limited to just part of the equipment that was provided through Japan's Grant Aid in the past.

② It is too early to carry out the introduction of fully digitized broadcasting systems at the present time because digital technology is still developing. However, individual items of equipment in which stable digital operation has been achieved shall to some extent be introduced to lay the foundations for a future age when broadcasting is carried out through fully digitized systems.

③ The implementation of broadcasting through the introduction of an education channel, which is one of the long-term plans of SLRC, shall not be included in the Project, but the introduction of Sinhala and Tamil language broadcasting (multi-language broadcasting) shall be aimed for in order to realize a broadcasting service that is fair and impartial to both the Sinhalese and Tamil sections of the population.

④ As this is a project for equipment supply, the Sri Lanka side shall be responsible for the construction of any necessary facilities (buildings, steel towers, etc.).

(1) Pidurutalagala Main Transmitting Station

When renewal of the transmitting equipment to be provided for Pidurutalagala Main Transmitting Station, renewal criteria was mainly given to the current state of deterioration, the stability of the existing equipment, and the shortage of spare parts, etc.

Pidurutalagala Main Transmitting Station was constructed in 1982 (15 years ago) through Japan's Grant Aid. Programs produced at Colombo Broadcasting Center are transmitted to Pidurutalagala Main Transmitting Station by the STL (studio-to-transmitter link) that connects both sites.

The STL transmitters at Colombo Broadcasting Center still fulfill its transmitting functions but is in a deteriorated state. Serious deterioration can also be seen in the STL receiver. The TV transmitter (vacuum tube type) at Pidurutalagala Main Transmitting Station has already reached the stage of frequent breakdown and the number of breakdowns that occur is increasing every year. Regarding spare parts for the STL and TV transmitter, enough were provided under the original grant aid to last for around 5 years, however, these parts have all been used up. In particular, TV transmitter vacuum tubes, etc. are no longer produced in Japan and are impossible to procure. Any further breakdowns in the equipment could even lead to the interruption of transmission.

Summing up, transmitters, peripheral equipment and STL transmitters and receivers have passed their useful lives and are in need of renewal.

(2) Primrose Hill Transposer Station and Hantana Transposer Station

When verifying the appropriateness of transmitting equipment to be renewed to Primrose Hill Transposer Station, renewal criteria was given to gauging the current state of deterioration and securing stable transmitting capabilitiy over the service area.

Resolving the poor reception area at the Kandy city, it was necessary to examine two alternatives - either increasing the transmitting output of Primrose Hill Transposer Station, or constructing a new transposer station at Hantana - were performed with the site survey.

As a result of the site survey, it has been judged appropriate that a transposer station at Hantana is constructed to ensure wider service area at Kandy and that the existing Primrose Station remains with less power output to relief poor reception area due to mountain shadow at the outskirts of Kandy.

Like Pidurutalagala Main Transmitting Station, Primrose Hill Transposer Station was constructed 15 years ago, and the deterioration of transmitting equipment has reached serious levels with the frequent breakdowns increasing year by year.

As a result of the site survey, it became clear that no major expansion in the service area could be anticipated through raising the transmitting power output of Primrose Hill Transposer Station. Originally the transmitting point is at low altitude there are districts of poor reception in the service area. The reasons why this site was selected as the transmitting point in the survey for the original grant aid project 15 years ago was that as Hantana was designated as a natural preservation area, then the construction of transmitter stations was not permitted, (however, following deregulation the construction of facilities has come to be allowed on a conditional basis). At Primrose Hill, access was better and the electricity supply was in place. Later private stations were constructed after the completion of Primrose Hill Transposer Station are currently all located at Hantana where the transmitting conditions are much better.

The relationship between Primrose Hill and Hantana is indicated in Figure 2-2-1.
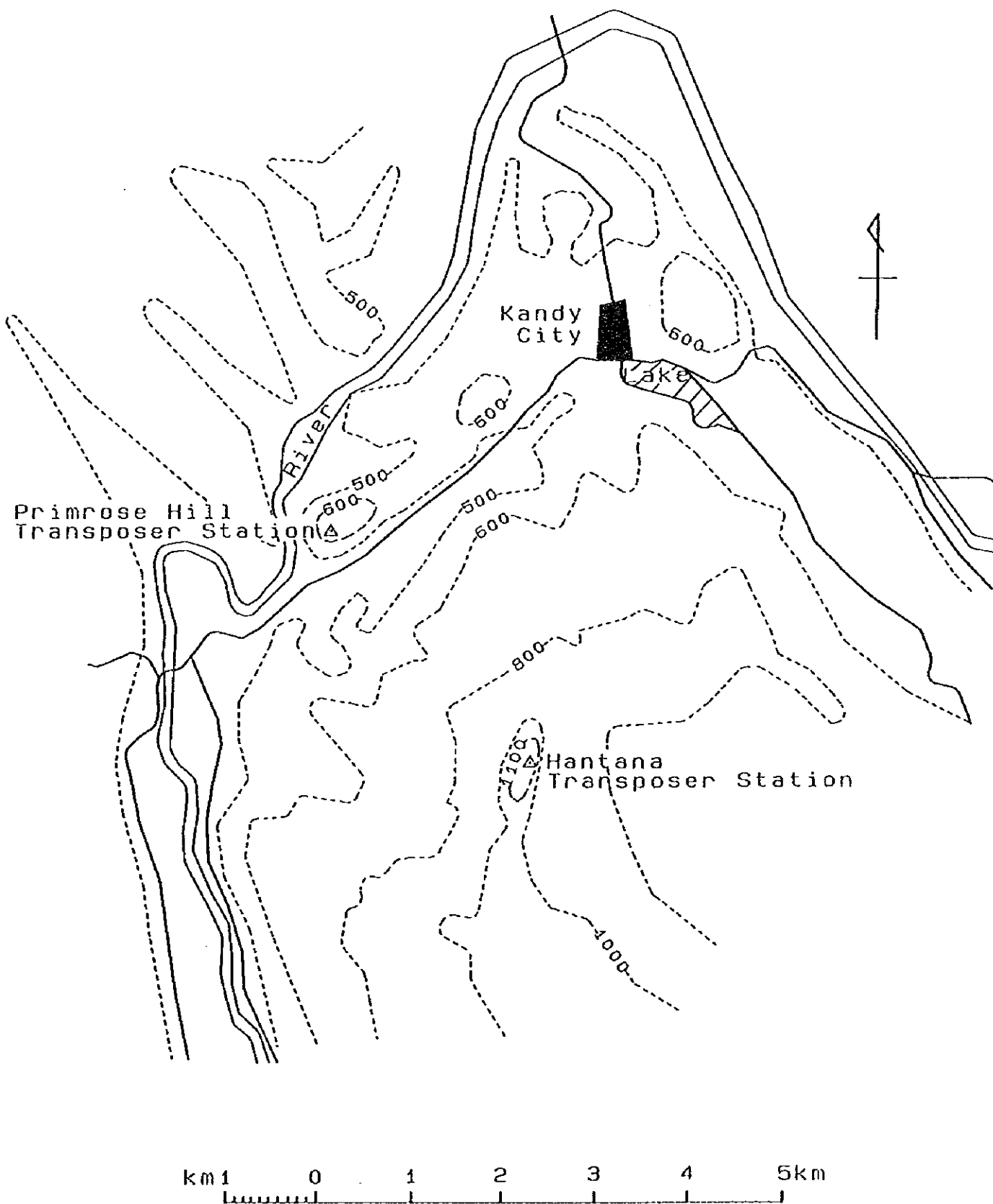
Figure 2-2-1   Relationship Between Primrose Hill and Hantana

There is a mountain path to the top of Mount Hantana and it is an ideal site for a transposer station in that it affords a complete view of Kandy and its environs.   Private broadcasting stations have already constructed facilities there and provide a good quality service to the Kandy area.

In view of the above points, the study team determined that it would be appropriate to renew the transposer with antennas for Primrose Station and to donate a transmitter with antennas and an engine generator for Hantana Station which will be built by SLRC.

(3) Sinhala/Tamil Language Simultaneous Broadcasting

When verifying the appropriateness of introducing Sinhala/Tamil language simultaneous broadcasting (multi-language broadcasting), consideration was given if SLRC has a definite plan and a countermeasures for the introduction of multi-language broadcasting in view of the social background in Sri Lanka.

1) Necessity of Multi-Language Broadcasting and the Social Background

(a) Social Background

Sri Lanka is a multi-racial state with 74% of the population belonging to the Sinhala race, 18% to the Tamil race and 8% to other races.   In order to establish a unified nation, the Government of Sri Lanka recognizes both of the Sinhala and the Tamil languages as the official languages in line with the principle of equal.

One means of realizing improvement in this area is implementation of the Sinhala/Tamil language simultaneous broadcasting being proposed by SLRC.

(b) Plan for Introduction of Simultaneous Broadcasting in SLRC

SLRC believes that harmonization between the Sinhala and Tamil races can gradually be encouraged if it can broadcast news and education programs (those programs which grab the attention of people most) simultaneously in the Sinhala and Tamil languages. Sri Lanka has two official languages (Sinhala and Tamil) and one common language (English).   SLRC hopes to achieve the following objectives by broadcasting news and education programs

simultaneously in Sinhala and Tamil (multi-language broadcasting).

a) Equalization of Broadcasting hours by Languages

Viewed in terms of language, 57% of current SLRC broadcasting hour consists of Sinhala language programs, 25% consists of English language programs and 18% consists of Tamil language programs, indicating that the ratio of Tamil language programs is extremely low. The first step for improving this situation is the implementation of simultaneous Sinhara and Tamil language broadcasting for news and education programs. SLRC has plans to achieve an overall program composition of 35% Sinhala language, 35% Tamil language, 25% English language and 5% other languages programs by 2003.

In the current system of news broadcasting at SLRC, each day's news scripts are translated into three languages by 6.00 p.m. and the same news program is repeated three times, first in Tamil, then in Sinhala and then in English. The introduction of simultaneous broadcasting would expand the broadcasting service to different races by enabling news programs that have Sinhala as the main sound channel to be broadcast with Tamil as the sub-sound channel, and vice-versa.

Another area SLRC putting effort into is education broadcasting.

In its plans to achieve multi-language broadcasting, SLRC also aims to equalize language-separate program hours in the area of education programs. In the event where multi-language broadcasting is introduced for education programs, SLRC first aims to apply it to science and mathematics programs because broadcast hours for these programs are currently insufficient.

SLRC has also put forward the following staffing plan in order to achieve Sinhala/Tamil language simultaneous broadcasting.

① Program Planning division
(increase of the staff: 8 members)
● Supervise director .... (1)

- Sinhala/Tamil language program screening ..... (1)
- Sinhala/Tamil language programmers .... (2)
- Program draft writers .... (2)
- Sinhala/Tamil translators .... (2)

② General Program department, dubbing division
   (New establishment: 17 members)
   - Supervise director .... (1)
   - Sinhala/English assistant director .... (1)
   - Sinhala/English producer .... (1)
   - Sinhala/English program assistants .... (5)
   - Tamil language assistant producer .... (1)
   - Tamil language producers .... (2)
   - Tamil language program assistants .... (5)

b) Receiver Dissemination Plan

In order to raise the effect of multi-language broadcasting, the dissemination of television sets and adapters able to receive multi-language broadcasts is a major factor.

Multi-language television sets are commercially available throughout Southeast Asia at prices that are far cheaper than retail prices in Japan. For example, a 20 inch conventional television set costs only 50,000 yen and a 20 inch multi-language television set costs 57,000 yen in Singapore.

The adapters, which are attached to the input side of conventional television sets to enable them to receive multi-language broadcasts, are not sold on the Singapore market and are not even produced by major Japanese manufacturers. Then MTV aims to either establish a subsidiary company within Sri Lanka to make such adapters, or consign production to a domestic manufacturer and sell adapters at a low price.

When MTV commenced UHF broadcasts in 1993, the government granted import tariff and tax exemptions for the import of UHF antennas by MTV. On this occasion the UHF antennas sold domestically for 600 yen (300 Rp.), which was an accessible price for viewers (UHF antennas cost around 5,000 yen in Japan).

In the event where it introduces multi-language broadcasting, SLRC intends to petition the government to either exempt

tariffs on component parts imported for the domestic production of multi-language television sets and adapters, or to take tax reduction measures. The tax (including tariffs, etc.) imposed on purchases of electrical products in Sri Lanka is very high at 90%, so in order to achieve the early dissemination of multi-language broadcasting, it will be necessary for the government to take steps for special tax reductions in this area.

SLRC plans to disseminate multi-language broadcasts by installing 50 multi-language television sets in community centers in Tamil districts in the north and east of the country.

(c) **Equipment Required for Sinhala/Tamil Language Simultaneous Broadcasting**

In the case where Sinhala/Tamil language simultaneous broadcasting is implemented, it will be necessary to prepare program production equipment and transmitting equipment that is furnished with multi-language broadcast functions. The necessary equipment for simultaneous broadcasting is listed below.

- Part of the equipment for No. 2 studio
- Part of the equipment for the master control room
- STL (studio-to-transmitter link) transmitter and receiver for program transmission between Colombo Broadcasting Center and Pidurutalagala Main Transmitting Station
- Transmitters for the main transmitting station and transposer stations
- Multi-language broadcasting equipment (NICAM encoder and modulator, etc.)

The multi-language broadcasting equipment (NICAM encoder and modulator, etc.) is equipment purely necessary to carry out multi-language broadcasting. According to the estimation by the study team, the cost of such equipment as a ratio of the total Project cost will likely be around 4%.

As the PAL system is used in Sri Lanka, the mode that multi-language broadcasting can take in order to be compatible with the

PAL system can either be the NICAM system (British system) or the West German system. The NICAM system, being a digital system, is world-renowned for its high sound quality. All that carry out multi-language broadcasting in Southeast Asia use the NICAM system, and it is considered that this is the optimum system to adopt for the purposes of the Project, too.

Note: The multi-language system developed in Japan is used for NTSC color system and not for PAL color system.

(4) Master Control Room

The validity of the equipment to be renewed for the main control room of the Colombo Broadcasting Center was justified in such main criteria as the degree of deterioration and the level of equipment performance capable of supporting the future broadcasting plan together with additional criteria, including the ease of operating use and efficiency.

The master control room equipment, as with the other equipment and facilities, was installed through Japan's Grant Aid in 1982. The broadcasting hour of SLRC was originally four or five hours per day, but this has increased to a maximum of 18 hours per day mainly consisting of news, education and general culture programs, then the existing equipment cannot be said to have the capacity to cope with such broadcasting hours. Moreover, because the frequent use of the master control room equipment means that periodic checks cannot be carried out, the level of deterioration is extreme.

The master control room is the key facility for program sending-out and possesses the core functions of the center. Moreover, the master control room has the function of network of resource materials that are transmitted from internal equipment, live broadcast from outside or other stations. The master control room also contains the various displays needed to monitor for equipment problems or abnormal sound and picture quality in programs. Finally, the master control room contains intercommunication facilities for communicating within the center or with other stations, and facilities for keeping VTR tapes, which are the resource materials for program production.

Upon surveying the deterioration of equipment in the master control room, it was concluded that the partial renewal of the following items is necessary except useable equipment.

1) Master Switcher and Routing Switcher

Renewal of the master switcher, which performs the most important functions of the sending-out system, is essential. The existing master switcher is so badly deteriorated that it is only partially functioning and causing problems in overall work. Moreover, the switcher cannot input the increased numbers of sources that are needed following the increase in broadcasting times. The routing switcher, too, is not functioning satisfactorily due to deterioration.

2) Automated Program Sending-out Facility

The types of programs sent out by SLRC are finely divided into numerous classifications within the program planning process. As the sending-out work is performed manually SLRC is suffered from frequent human errors in the operation. It is very important to be minimized the incidental human errors. Thus, it is necessary to introduce an automated program sending-out facility that uses a computer in order to achieve the error-free sending-out of programs.

3) Clock System

SLRC programs are sent out systematically according to a time schedule. Moreover, SLRC utilizes communications satellites to carry out program exchanges at set times with overseas broadcasting stations on a daily basis. However, because deterioration of the existing clock system is leading to delays and other problems in terms of timing accuracy, it is necessary to install an accurate GPS (global positioning system) satellite-receiving clock system.

4) Reproduction VTR

Renewal of the reproduction VTRs is essential. The existing VTRs are classified a previous generation and are currently not functioning due to breakdown. The VTRs are well past their useful service life and the procurement of spare parts for repair is difficult. As a result, SLRC is reproducing programs using semi-professional type industrial VTRs which it purchased itself. It is obvious that replacing these industrial VTRs with professional type

broadcasting VTRs would lead to a major improvement in the picture quality of programs.

5) Other Deteriorated Equipment in Need of Renewal

(a) Synchronizing signal generator

a device for generating reference signals needed to operate all the color video equipment in the broadcasting center

(b) Frame synchronizer

a device for synchronizing outside signals to the master control room

(c) Caption scanner

a camera for shooting hand-written titles, figures and letters, etc. and inserting them on the programs

(d) Video timer

a device for making time image signals that are synchronized with the clock system of the Broadcasting Center

(e) Uninterrupted power supply system

a battery system for use at the time of city power failure untill engine generator starts up

(5) Studio and Sub-Control Room Facilities

The degree of deterioration and equipment functions capable of supporting the production of studio programs were mainly based on the judgement criteria to verify the validity of renewal of the studio program production equipment at the Colombo Broadcasting Center.

All of three studio sub-control room facilities were installed in the two previous grant aid projects. The sizes and functions of studios are designed according to the purpose of studio use, i.e. production of music programs or drama programs, etc. The three studios that were provided are No. 1 Studio (medium-scale) used for education programs, talk programs and discussion prpgrams, No. 2 Studio (small-scale) used for news programs and announcements, and No. 3 Studio (large-scale) used for music programs and the production of drama programs.

Of the facilities indicated above, the sub-control room of No. 3 Studio was provided in the second phase of the previously implemented grant aid in 1984. Although deterioration has started to set in, the equipment is still in a usable condition. Therefore, it is desirable to exclude renewal of the Studio-3 sub-control room facility from the Project and only renew the cameras and VTRs facilities of Studio-1, and the cameras and sub-control room of Studio-2.

The following paragraphs describe in detail the individual items of equipment to be renewed.

1) No. 1 Studio Facility

Renewal of No. 1 Studio facility shall be limited to renewal of studio cameras. The existing studio cameras are the old type using pick-up tubes; which result frequent clor deviation and electrical instability in program reproduction. At present one of the existing studio cameras is broken down, but it is not repaired because spare parts for repair are difficult to obtain.

On the other hand the existing camera pedestals are still in usable condition they shall remain without replacement. Although the sub-control room equipment is deteriorated, there is little urgency for renewal when one considers that programs produced in this studio are recordings and a few live broadcasts. Moreover, in the event where breakdowns do occur, it will be possible to carry out repairs using parts from equipment that will be replaced under the Project.

2) No. 2 Studio Facility

No. 2 Studio is used to record news programs and announcements and produce live broadcast programs. Considering the importance of this studio for live broadcasting such as emergency news reports, etc. it is strongly required that the broadcasting equipment should be in stable condition. However, the cameras in No. 2 Studio are the same type as those in Studio 1 and deterioration is severe. The sub-control room facility is also badly deteriorated and lacking in the stability needed to produce live programs. Consequently, it is necessary to carry out the renewal of studio cameras and the whole sub-control room facilities (video mixing amplifier, audio mixing amplifier, etc.). However, as the existing lighting console, lighting equipment and studio camera pedestals are still usable, they shall remain without replacement.

(6) Outside Broadcast Van

The degree of deterioration and purpose of use of the OB-Van, such as on-the-spot relay (program availability for live relay, types of relayed programs and frequency of on-the-spot relay, etc.) were mainly based on the judgement criteria to verify the validity of renewal of the broadcasting equipment mounted to the OB-Van.

The outside broadcast van is loaded with cameras, video and audio equipment, lighting equipment and a kind of generator and can be described as a compact, mobile broadcasting station for use in the production of outside programs.

Like other equipment and facilities at SLRC, the outside broadcast van was provided through Japan's Grant Aid in 1982. The van is used for around 120 days outside broadcasts annually, however, it can be said that the van is in operation every day throughout the year. Because it is necessary to fully check and service the van equipment before and after broadcasts.

SLRC utilizes the mobility of the outside broadcast van to produce outside broadcast programs of presidential speeches, concerts (traditional dance, etc.), viewer-participation programs and various other events (Perahera festival, etc.). However, the outside broadcast van that was provided through the original grant aid is no longer operating by the deterioration. The reason is that outside broadcast-van is having been continually used on the move to produce programs in severe weather conditions, etc. In its place, SLRC currently uses a second-hand microbus loaded with cheap and low grade program production equipment which it purchased under its own budget. The quality of outside broadcast programs produced by this microbus is far below the level that viewers demand.

In particular, broadcasts popular sports (cricket) are one of the rolles of the state broadcasting. The Government cosigns SLRC to provide live coverage all of the international cricket matches that are played in Sri Lanka several times each year. Because audience ratings for cricket broadcasts reach as high as 85%, the commercial income that is obtained during matches is an important income source for SLRC.

Consequently, in consideration of the high operating rate and current state of deterioration, it is judged that renewal of the outside

broadcast van is essential for continuing outside broadcasts and enabling state broadcasting to achieve one of its duties.

(7) Editing Room Facility

The degree of deterioration and equipment functions capable of supporting the required editing work were mainly based on the judgement criteria to verify the validity of renewal of the editing room equipment at the Colombo Broadcasting Center.

One medium scale and five small scale editing room facilities suited to the contents of editing work were provided through Japan's past grant aid.

Editing room work involves taking resource tapes of studio recordings or news gathering and making them into more attractive program resources by removing unnecessary parts, rearranging the order of contents or inserting music, and so on.

Following increased times of use resulting from a higher program self-production rate, most of the editing room equipment at SLRC is badly deteriorated and in some cases is broken down and inoperable. In particular, the cheap post production equipment that SLRC purchased with its own funds is of inferior capacity compared to post production functions of equipment at broadcasting stations in general and is not suited to the production of high quality programs.

The editing room equipment in need of introduction and renewal is described in detail below.

1) Post Production Equipment

Post production equipment was not included within Japan's past Grant Aid projects, however, the need for such equipment has increased since then in line with improvements in program production techniques. SLRC purchased and is operating simple equipment with its own funds in order to raise its program editing capacity, however, because the functions of this equipment are not sufficient, it is unable to achieve the results that were originally hoped for.

It is necessary to introduce additional instruments to the existing equipment. It is judged that the introduction and renewal of the following areas of post production equipment are necessary.

(a) Post Production VTR Editing System

A post production VTR editing system generally consists of two playback VTRs, one recording VTR, a VTR remote panel, an editing controller and monitors, etc. In recent times the editing of drama programs often involves repeated dubbing of 10 times or more. In post production where such repeated dubbing is performed, it is necessary to introduce a digital VTR editing system in which picture quality is not adversely affected by this repeated editing work.

(b) Digital Video Effect (DVE) Equipment

The effects made possible by DVE equipment are generally picture reduction and enlargement, sliding (changing to the next screen by sliding the current screen away in the direction of one's choice), rotation, multiple display (displaying multiple picture- either the same or different ones - simultaneously), mirror effect, and trailing (giving figures or letters a comet-like trail effect), and so on. DVE is indispensable for large editing room and it has come to be considered in the recent broadcasting world that post production cannot take place without such equipment.

(c) Computer Graphics (CG)

CG is a technique for drawing charts, figures and pictures by computer and has developed to the stage where virtual images not possible through television camera can be created. CG can be used in animation programs or general program titles and explanatory graphics, etc. The introduction of CG is strongly required at SLRC because it is extreamely effective in the educational program production. Such equipment as with DVE, is considered to be indispensable for program production.

(d) Other Equipment in Need of Renewal

- Video mixing amplifier
  the existing video mixing amplifier is inoperable. Renewing this at the same time as introducing DVE will make it possible to produce complex prpgram contents.

- Audio mixing amplifier

    the existing audio mixing amplifier is inoperable. An audio mixing amplifier is needed to create effective sound by digital processing.

2) **Medium-Scale Editing Room Equipment**

    Medium-scale editing room equipment generally consists of two playback VTRs, one recording VTR, a VTR remote panel, editing controller, video mixing amplifier, audio mixing amplifier and monitors, etc. Compared to small-scale editing room equipment, the additional functions of dissolve change (simultaneous fading out and fading in of screens) and wipe effect (wiping of current screen from left to right by imposing the next screen, etc.) are possible. Equipment for one medium-scale editing room was provided in the past grant aid projects, however, breakdowns and the inability to obtain spare parts have seriously limited the use of this. Therefore, the full renewal of editing facilities for one medium-scale editing room is necessary.

3) **Small-Scale Editing Room Equipment**

    Small-scale editing room equipment generally consists of one playback VTR, one recording VTR, a VTR remote panel, editing controller and monitors, etc. Equipment for five small-scale editing rooms was provided in the past grant aid projects, but two of these rooms are not currently operating due to equipment breakdown. Therefore, it is necessary to renew editing facilities for two small-scale editing rooms.

2-2-2   Basic Concept of the Project Based on the Results of the Survey
         and Discussions

(1) Scale and Specifications of Project Equipment
    In consideration of the results of the examination described in the
    previous sections, the scale and specifications of equipment to be
    provided under the Project shall be determined based on the following
    thinking.

    1) Simultaneous Broadcasting by Shinhala and Tamil language (Multi-
       language Broadcasting)

       (a) Selection of Multi-language Broadcasting System
           The systems used for multi-language broadcasting throughout the
           world differ according to the color television system adopted in
           each country. As the PAL system is used for state television in
           Sri Lanka, the mode that multi-language broadcasting can take in
           order to be compatible with this can either be the NICAM system
           or the West German system indicated below. Looking at the multi-
           language broadcasting systems adopted by the Asian broadcasting
           stations, it can be seen that the stations that were established
           relatively early use the West German system and the later
           developing stations use the NICAM system. Moreover, the
           receivers used in multi-language broadcasting are compatible
           with both these systems. Table 2-2-1 shows the comparison
           between the West German system and the NICAM system.

Table 2-2-1 Comparison Between the West German System and NICAM System

Multi-language Broadcasting System	Features	Stations Conducting Multi-language Broadcasting in Asia
A. NICAM system (British system)	1. Maximum number of transmittable languages .... 3 languages 2. Sub-channel modulation system .... digital 3. Sound quality of the sub-channel is high	1. Singapore SIMCOM (exclusive station for broadcasting the private TV-12) 2. Indonesia IVM (new private broadcaster) 3. Malaysia RTM (national), TV-4 (municipal broadcasting) 4. Thailand SIAM-TV (being planned, new private broadcaster)
B. West German system	1. Maximum number of transmittable languages .... 2 languages 2. Sub-channel modulation system .... analog 3. Sound quality of the sub-channel is lower than that in the NICAM system	1. Indonesia TVRI (national), SCTV (private) 2. Malaysia TV-3 (private) 3. Thailand MCOT (national)

As can be gathered from the above table, the digital modulation of the NICAM system gives a higher sound quality than the analog modulation of the West German system, however, there is practically no difference in the equipment costs of both systems.

The study team believes it appropriate to adopt the NICAM system for the implementation of multi-language broadcasting under the Project.

(b) Equipment Required for Multi-language Broadcasting

In the case where multi-language broadcasting by means of the NICAM system is implemented, the program production equipment and transmission equipment must possess the multi-language broadcasting functions. The specific equipment specifications are given below.

a) Television Broadcasting Transmitter Compatible to Multi-language Broadcasting

It is necessary to install television broadcasting equipment that satisfies not only the characteristics of the conventional television broadcasting equipment at Pidurutalagala Main Transmitting Station, but also the characteristics of multi-language broadcasting (crosstalk characteristics, separation characteristics, etc.).

- Television broadcasting Transmitter compatible to multi-language broadcasting
  Equipment with multi-broadband sound CIN and sound broadcaster group delay compensator functions, etc.
- Television demodulators
  NICAM demodulators with terminals

b) Television Transposers Compatible to Multi-language Broadcasting

It is necessary to install television transposers that satisfy not only the characteristics of the conventional television transposers, but also the characteristics of multi-language broadcasting (cross modulation characteristics, broadband frequency characteristics, broadband group delay characteristics, etc.). The new transposers shall be installed in the transposer stations at Primrose Hill and Hantana.

c) Television STL Equipment for Transmission of Dual Sound Channels

It is necessary to install television STL equipment that satisfies not only the characteristics of the conventional television STL equipment, but also the characteristics that are required for the transmission of sound sub-channels and in broadband amplifiers capable of transmitting a sound sub-channel. An STL transmitter for sound sub-channel transmission shall be installed in Colombo Broadcasting Center and an STL transmitter with the same capability shall be installed in Pidurutalagala Main Transmitting Station.

d) Sub-sound Announcing Booth

SLRC is aiming to carry out Sinhala and Tamil language simultaneous broadcasting of news and education programs as

the first stage of improvement. In order to achieve this, it is necessary to make a studio that is compatible to multi-language broadcasting.

The microphone input from the No. 2 studio currently used for news programs can be used as it is now for the main sound, however, in order to simultaneously broadcast the sub-sound, a sub-sound simultaneous interpretation announcing booth will have to be newly installed within the No. 2 studio. The contents of this are as follows.

<Sub-sound Announcing Booth>

- Number of booths 1
- Size of booth .... for one announcers
- Number of microphones 1
- Number of monitor television sets 1
- Number of fader units 1

e) Master Control Equipment with Sub-sound Sending-out Functions

Because the existing master control equipment can only be used for main sound control and sending-out, it is necessary to newly install master control equipment that possesses sub-sound sending-out functions.

f) Multi-language Broadcasting Instruments (NICAM System)

In addition to the above equipment, it is necessary to install the following instruments in order to achieve multi-language broadcasting:

- NICAM encoder and modulator (Pidurutalagala Main Transmitting Station)
- NICAM demodulator (Pidurutalagala Main Transmitting Station)
- Sound limiting amplifier for main sound and sub-sound use (Pidurutalagala Main Transmitting Station)

2) Pidurutalagala Main Transmitting Station

(a) 20 kW Television Broadcaster (Transmission Channel-5)

A full solid state transmitter, which has high reliability and requires little maintenance, shall be adopted as the television transmitter. The transmitter standards shall be in accordance

with ITU-R Report 624-3. One transmitter containing two driving stages, which are more prone to breakdown than other parts, shall be adopted. The power amplifier stage shall consist of 20 power amplifier units, so that power will only drop by 5% should one of the units break down. Regarding the blower needed to supply wind for cooling to the power amplifier units, one general-purpose blower shall be installed together with one for standby purposes. The dimensions of the suction and exhaust ducts shall be determined according to the wind supply capacity.

(b) Coaxial Output Equipment

The coaxial output equipment consists of CIN equipment (Constant Impedance Notch Diplexer, visual and aural combiner) and a changeover switch for antenna and dummy load. The changeover switch for antenna and dummy load shall be the four terminal type. Moreover, the multi-language broadcasting characteristics shall be made to conform with the NICAM-728 standard. The following diagram outlines the coaxial output equipment.

* Common use with existing equipment
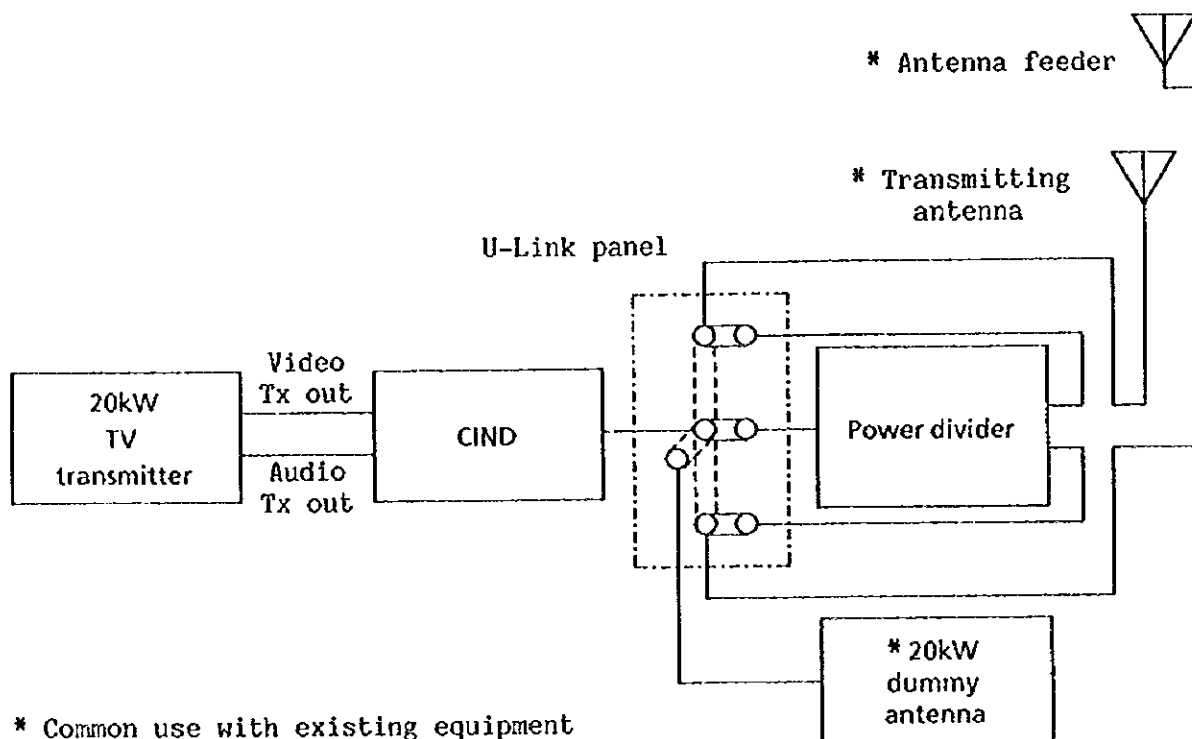
3) Primrose Hill Transposer Station

(a) 5 W Television Transposer (Transmission Channel-39)

The transmission channel of Primrose Hill Transposer Station is currently Channel-10, however, following construction of the new transposer station at Hantana, it will become necessary to alter the transmission channel. In order to allow Primrose Hill Transposer Station to fulfill its new role of transmitting to areas of poor reception which the Hantana Transposer Station will not be able to reach, it is desirable to change the transmission channel to UHF Channel-39. Channel-10, which has been used until now, is more suited to wider propagation because of VHF channel characteristics. It is thus appropriate to allocate this channel to Hantana Transposer Station. Considering that Primrose Hill Transposer Station will provide a service to areas of poor reception not covered by Hantana Transposer Station, a transmitting power output 5W is thought to be appropriate (the transmission output of the existing transposer is 50 W).

(b) Transmitting Antenna

In line with the change of the transmission channel to UHF Channel-39, it is necessary to replace the existing transmitting antenna with a UHF antenna. The new antenna shall be a 4 dipole antenna with one stage and one face.

(c) Receiving Antenna

The existing receiving antenna is installed 150 m apart from the transposer station, however, the new antenna shall be installed on the existing 30 m transmitting steel tower. In order to prevent interference from other channels, the new receiving antenna shall be a five element Yagi antenna for the exclusive reception of Channel-10.

(d) Measuring Equipment

In line with the introduction of UHF transposer equipment, VHF and UHF spectrum analyzers shall be provided for maintenance purposes. The existing VHF signal generator shall be used as it is.

4) Hantana Transposer Station

(a) 200 W Television Transposer (Transmission Channel-10)

Hantana Transposer Station shall be responsible for broadcasting to Kandy (the second most populous city in Sri Lanka) and its environs. The station shall possess actual use equipment and standby equipment. considering redundancy of the system.

(b) Transmitting Antenna (Channel-10)

An omnidirectional transmitting antenna shall be used to provide the broadcasting service to Kandy and its environs. The antenna shall be VHF-4 dipole antenna with one stage and four faces. The antenna shall be attached to the TELECOM transmitting steel tower at Hantana, and the conditions for calculation of the steel tower strength for antenna attachment shall be as follows: antenna total weight 480 kg, antenna wind pressure load of 154 kg/m2 when wind velocity is 27 m/s.

(c) Receiving Antenna

A five element Yagi antenna for the exclusive reception of Channel-5 shall be installed to receive television waves (Channel-5) sent by Pidurutalagala Main Transmitter Station.

(d) Engine Generator

An engine generator shall be installed to allow broadcasts to continue unaffected during power interruptions. In view of the television transposer output of 200 W, the capacity of the engine generator shall be 26 kVA. The grade can either be professional grade or general grade, however, in consideration of the need for quick starting and starting for overload, the professional grade shall be adopted. The control circuit of the engine generator shall be one that self starts after detecting power interruption, however, regarding stop control, in view of the fact that the power supply conditions are poor and power voltage unstable, manual stopping shall be adopted.

5) Master Control Room

(a) Master Switcher and Routing Switcher

Colombo Broadcasting Center outputs domestic programs throughout Sri Lanka and also sends out overseas programs via comunications satellite. Moreover, in order to transmit differing program contents depending on domestic or overseas broadcasting, two master switcher systems for video and audio output are required. Furthermore, when one takes into account the Sinhala and Tamil language (multi-language) simultaneous broadcasting, a further one audio system will be required for the audio master switcher. Incidentally, in terms of the SLRC program composition, the number of input resources of programs requiring changeover by the master switchers will amount to 16.

The input and output capacity of the routing switchers, too, shall be raised to 32 in consideration of the numbers of input and output resources required. To achieve stability in the switchers, both the video and audio switchers shall be renewed to the digital type.

(b) Automated Program Sending-out Facility

The types of programs sent out by SLRC are finely divided into numerous classifications within the program planning process, however, because the sending-out work is performed manually by the SLRC engineers, the frequent occurrence of human errors in the program sending-out is proving to be a problem.

It is possible to prevent such errors by introducing an automated program sending-out facility that uses a computer. The system shall be one that allows easy changeover from the automated sending-out mode to the manual sending-out mode, in order to allow the system to cope with emergency broadcasts or broadcasting accidents.

(c) Clock System

Broadcasting is obliged to be carried out under the precise control of time. Because SLRC is expanding work in the area of program exchange with overseas broadcasting stations, etc. by means of satellite broadcast, the need for an accurate time control system is greater. Because Sri Lanka does not have its

own standard time service, it is necessary to install an accurate GPS (global positioning system) satellite-receiving clock system in order to achieve accurate time settings.

As was mentioned previously, SLRC conducts two sets of broadcasts for domestic and overseas use. Thus, the clock system shall be one which displays two times - the domestic time and the international time.

(d) VTR for Program Sending-out

Because the VTR scheduled to be introduced for post production is the digital type, it will be necessary to install two 1/2 inch digital VTR (one for standby) for sending-out in order to achieve compatibility.

(e) Synchronized Signal Generator

The synchronized signal generator is needed to generate reference signals for operating all the color video equipment in Colombo Broadcasting Center. Thus, two synchronized signal generators (including one for standby) shall be installed. The system shall allow switchover to the standby signal generator in cases of breakdowns.

(f) Frame Synchronizer

The frame synchronizer is needed to synchronize video signals sent from the OB van and from outside stations by satellite with the master control room equipment, so as to enable the master control room to receive them. Two frame synchronizers (one for standby) are required.

(g) Caption Scanner

A caption scanner is used to convert camera-shot hand-written titles, figures and letters into digital signals and insert them onto television screens. One caption scanner shall be provided for renewal.

(h) Time Generator

A time generator is used to generate time video signals that are synchronized with the clock system and display those signals in the corner of the television program screen. Because SLRC

broadcasts programs domestically and internationally, it requires two kinds of time generator to display the domestic time and the international time.

(i) Uninterrupted Power Supply

At times of power interruption, Colombo Broadcasting Center can continue broadcasting by using the engine generator, however, the generator requires a certain amount of starting up time before it is able to produce a normal voltage. Because the automated program sending-out system to be provided under the Project uses a computer, there is a danger that computer programs may be lost during this start-up period. It is normal for computers to be connected to an uninterrupted power supply able to respond instantaneously to power interruptions, in order to secure safety in work. Consequently, a system with automatic changeover during power interruptions shall be adopted, and an uninterrupted power supply capable of supplying 30 kVA (in view of the required power capacity for master control room equipment) for five minutes shall be needed.

6) Studio Sub-control Room Equipment

The studio and sub-control room facilities described below shall be required in accordance with the functions of each studio.

(a) No. 1 Studio Sub-Control Room Equipment

a) Studio Camera

There are currently three studio cameras but these need to be increased by one to four.

The No. 1 Studio mainly produces school broadcast programs and general education programs. In the case of such programs, prompter (device in line with camera that enable texts to be read) need to be provided to aid the presenters. However, because prompter are attached to camera lense, the studio camera become almost totally fixed. Therefore, in consideration of the functions of the No. 1 Studio, three studio camera shall be provided to replace the existing camera, and one more studio camera shall also be needed.

As a result of rapid advances in IC technology and charge

coupled devices (CCD), today's studio cameras are almost totally CCD cameras, except for ultra-high sensitivity and other special purpose cameras. As a result, cameras have become much more compact, lighter and more stable and the need to carry out adjustments during operation has almost totally disappeared.

Regarding the pedestals on which the studio cameras are mounted, the existing pedestals are still usable. Only one new pedestal shall be provided for an increased camera.

b) VTR

When programs are produced in a studio some program resources are often used which are recorded in another places. These resources are common in recording by analog type 1/2 inch VTR. Then it is necessary to provide one set of same type VTR for reproduction and one set for recording in No.1 studio.

(b) No. 2 Studio Sub-control Room Equipment

a) Studio Cameras

There are currently two studio cameras, however, these are not sufficient because broadcasts often take place with two announcers or casters shooting from the front and the side direction. Three CCD cameras shall thus be provided: two to replace the existing studio cameras and one more as an additional one. Because the existing camera pedestals can be used to mount the CCD cameras, only one new pedestal shall be provided and the existing two shall continue to be used.

b) Video Mixing Amplifier

When one considers the number of program resources used in news programs and the contents of the programs, it is necessary to provide a new analog video mixing amplifier fitted with 18 inputs, 2 MK (two television video switching amplifiers capable of creating composite screens by image mixing, cutting and inserting).

c) Audio Mixing Amplifier

When one considers the number of program resources used in news programs, it is necessary to renew the analog audio mixing amplifier. Because digital audio mixing amplifiers have only just been developed, meaning that such equipment would be expensive and there would be concern regarding the equipment stability, an analog audio mixing amplifier shall be provided.

d) VTR

For purposes of gathering news outside and re-broadcasting VTR tapes in news programs, it is necessary to introduce two analog 1/2 inch play back VTRs with compatibility. Furthermore, in order to record program materials sent by satellite or from the OB van, it is necessary to introduce one analog 1/2 inch recording VTR.

7) OB Van

(a) OB Cameras

At least six cameras are needed to cover the Perahera festival and sports events, which are major television outside program. The especially popular sport of cricket is played on an oval-shaped pitch larger than a baseball field and batsmen are allowed to hit the ball to any point on the ground (see Figure 3-2-2).
11 cameras are normally used for cricket broadcasts. Six of these shall be provided under the Project and the remaining five shall be prepared by the Sri Lanka side through self-help. The six cameras to be provided shall consist of two studio CCD cameras and four portable CCD cameras.

(b) Camera Zoom Lenses

Zoom lenses are required for outside broadcasts in order to focus on distant objects. In order to show the facial expression of a person standing 100 m away (not necessarily in a cricket match), two zoom lens with a magnification at least 45 times greater than a standard lens is required. Such lenses are so heavy that they can only be attached to studio cameras mounted

on studio camera pedestals. Consequently, two zoom lenses of 45 times magnification shall be provided together with the two studio CCD cameras.

(c) **Video Mixing Amplifier**

When one considers the number of resources of programs and cameras used by the OB van, one analog video mixing amplifier with 18 inputs and 2 MK is required.

CRICKET STADIUM
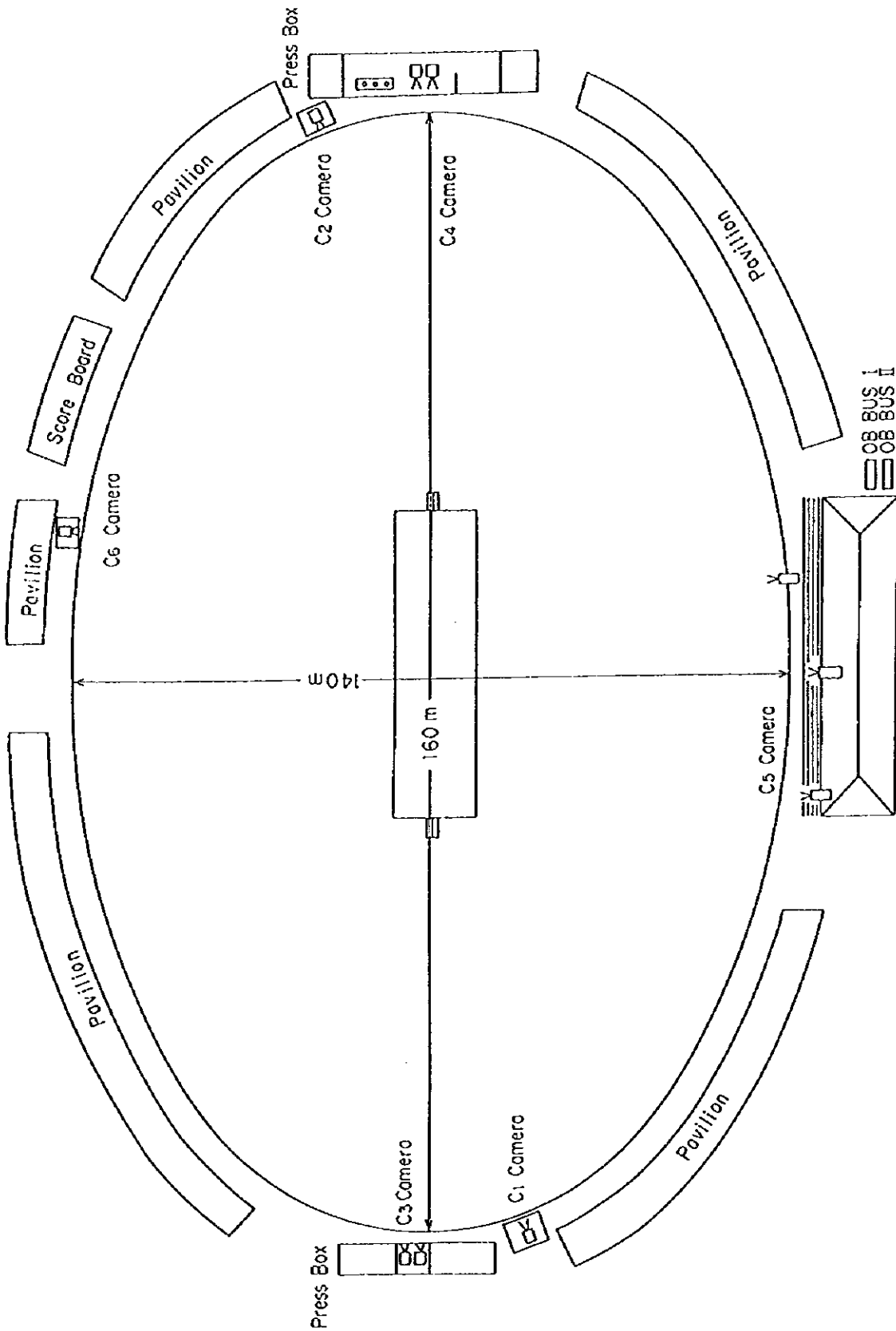
Press Box

Pavilion

C2 Camera

C4 Camera

Score Board

Pavilion

C6 Camera

Pavilion

160 m

140m

C5 Camera

OB BUS I
OB BUS II

Pavilion

C3 Camera

C1 Camera

Press Box

Pavilion

Figure 2-2-2 Layout of Cameras for Cricket Match Coverage

(d) Audio Mixing Amplifier

When one considers the microphones used by the OB van, one analog audio mixing amplifier with 24 inputs is required for 12 microphones.

(e) VTR

Because television outside broadcasts often tend to be live broadcasts, it is necessary to show highlight scenes by VTR or record images from different angles. Moreover, in sports broadcasts, it is necessary to replay exciting moments in slow motion. In consideration of this, two analog 1/2 inch VTRs capable of slow motion playback are required.

(f) Intercom System

Unlike studios, outside broadcast sites are very noisy places. In particular, in cases of music broadcasts, etc. in large arenas, the cheers of the crowd can make it difficult for assistants in charge of broadcast work to hear instructions given by the producer. Moreover, the instructions given by producers to assistants and cameramen often differ. For this reason, an intercom system that enables the producer to give instructions individually as necessary shall be introduced.

(g) Microwave FPU (Field Pickup Unit)

During television outside broadcasts, because it is necessary to transmit video and audio signals back to the broadcasting center, a set of microwave FPU (one each for transmitting and receiving) is required.

8) Editing Room Equipment

The editing room equipment described below is required to conduct the various editing functions.

(a) Post Production Equipment

a) Post Production VTR Editing System

A post production VTR editing system generally consists of two playback VTRs, one recording VTR, a VTR remote panel, an editing controller and monitors, etc. This sort of VTR

editing system is known as an AB roll editing system (see Figure 3-2-3).

As was mentioned earlier, in recent times the editing of drama programs often involves repeated dubbing of 10 times or more. In post production where such repeated dubbing is performed, it is necessary to introduce two digital 1/2 inch playback VTRs and one recording VTR (digital 1/2 inch AB roll editing system) in which picture quality is not adversely affected by this repeated editing work.

b) Video Mixing Amplifier

When one considers the number of input resources used in post production, the renewal of one digital video mixing amplifier with 16 inputs and a 2 MK with digital video effects (DVE) unit is required.

c) Audio Mixing Amplifier

When one considers the number of input resources used in post production, the renewal of one analog audio mixing amplifier with 12 inputs is required.

d) Computer Graphics (CG)

Computer graphics is advancing rapidly due to the developments being made in computers and also software. As a result, CG techniques have come to be incorporated a lot in recent television program production.

Considering the fact that today's latest CG will probably become obsolete in a few years' time, it is thought appropriate to provide medium range equipment under the Project with the aim of letting the staff at SLRC become familiar with the basics of CG.

CG equipment with the following functions shall be selected:

- Equipment capable of creating three-dimensional screens
- Equipment possessing modeling, rendering and animation functions
- Equipment with computers in the personal computer range

(b) Medium-scale Editing Room Equipment

Medium-scale editing room equipment can be described as a less

functional version of post production equipment possessing only an AB roll editing system. Compared to small-scale editing room equipment, the additional functions of dissolve change and wipe effect are possible. The AB roll system of the medium-scale editing room shall be made analog to give it compatibility with the VTR units in each studio and the OB van.

Medium-scale editing room equipment shall consist of the renewal of one analog 1/2 inch AB roll editing system.

(c) Small-Scale Editing Room Equipment

Small-scale editing room equipment generally consists of one playback VTR, one recording VTR, a VTR remote panel, editing controller and monitors, etc. Such equipment is referred to as a 1:1 VTR editing system (see Figure 2-2-3).

The main purpose of small-scale editing equipment is to edit VTR tapes that have been gathered and recorded for news programs, etc. Thus, two analog 1/2 inch VTR editing system shall be renewed to ensure compatibility with the gathered and recorded VTR tapes.

2:1 VTR Editing System (AB Roll Editing System)
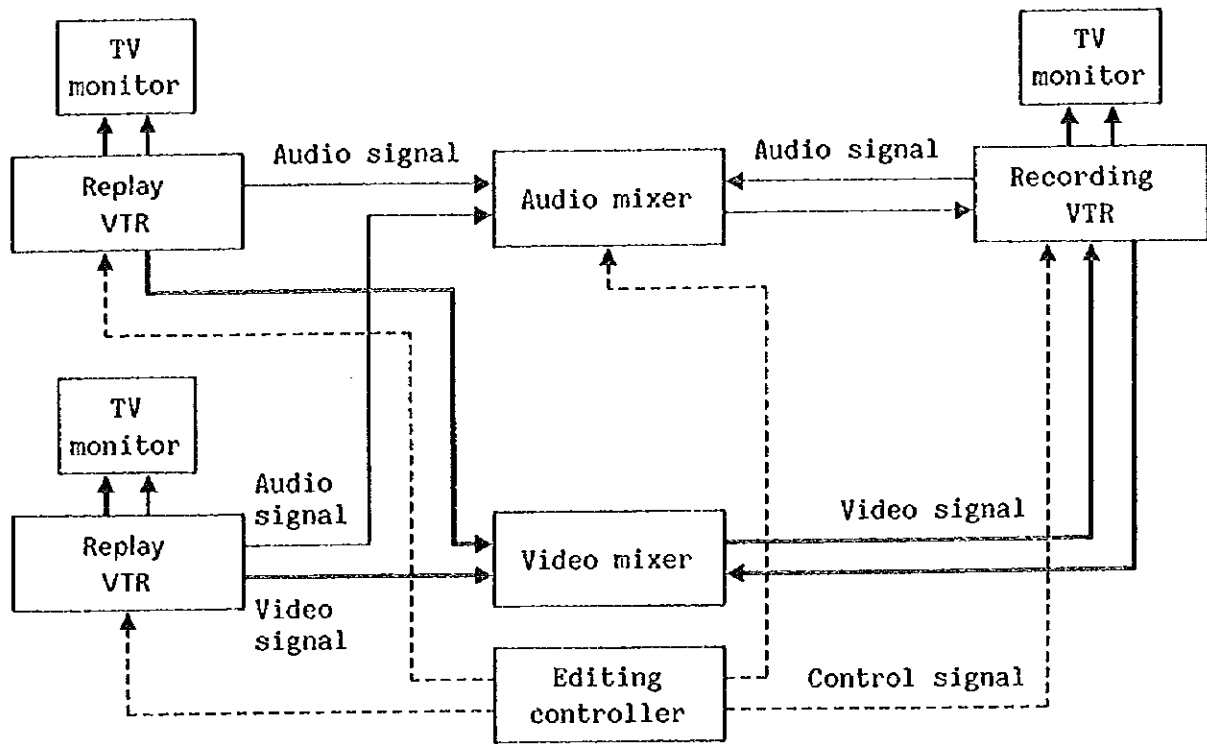
1:1 VTR Editing System)
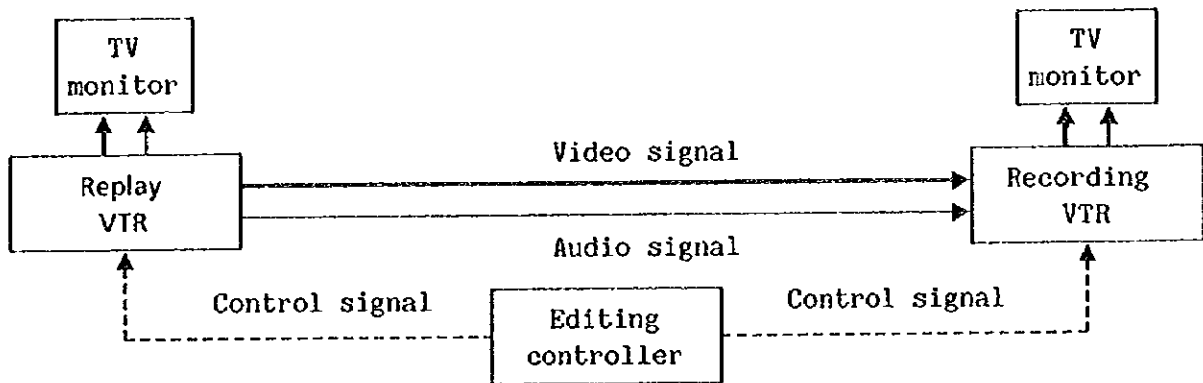
Figure 2-2-3   VTR Editing System

(2) Standards

The standards of equipment to be provided under the Project must conform to the following.

<International Standards>

- ITU (International Telecommunication Union) technical standards must be conformed to.
- IEC (International Electrotechnical Commission) technical standards must be conformed to.
- SMPTE (Society of Motion Picture and Television Engineers) technical standards must be conformed to.
- EBU (European Broadcasting Union) technical standards must be conformed to.

<Domestic Standards>

- JIS (Japanese Industrial Standards) must be conformed to.
- EIAJ (Electronic Industries Association of Japan) technical standards must be conformed to.

<Other>

- Equipment must conform to the Sri Lanka national television system (PAL-B System).

2-3 Basic Design for the Optimum Project Case

2-3-1 Design Concept

In consideration of the role to be played by television broadcasting in the achievement of long-term plans in Sri Lanka and links with past grant aid projects of equipment provision conducted by the Government of Japan, the broadcasting equipment to be provided under the Project must have high stability and reliability and must be functional over the long term.
Based on this basic concept, design of the equipment shall be carried out with consideration given to the following points.

(1) Concept Regarding Natural Conditions

The whole of Sri Lanka is situated in the tropics and is greatly affected by the monsoon. Great care is required in the design of facilities (ensuring complete air conditioning, etc.) because broadcasting equipment is highly prone to the effects of high temperatures and high humidity. Although the Project only involves the provision of equipment, the consultants shall provide technical guidance to SLRC on air conditioning conditions in buildings, etc. to ensure the proper operation and maintenance of the equipment.

(2) Concept Regarding Social Conditions

The population of Sri Lanka consists of numerous races (Sinhalese, Tamils, etc.) each possessing their own language and culture, and so on, and there is also great variety in terms of religion, with Hindus, Buddhists, Moslems and Christians, etc. all to be found among the Sri Lankan people.
SLRC will greatly contribute to nurturing mutual understanding among people and promoting harmony between races by introducing the unique cultures, etc. of each race and presenting education programs via its television broadcasts. For this reason, the broadcasting equipment to be provided under the Project shall possess multi-language broadcasting functions.

(3) Concept Regarding Construction Conditions

Works relating to the construction of a steel tower and buildings, etc. required for the Project shall be borne by the Sri Lanka side. Conditions in the construction industry in Sri Lanka differ greatly

between the private sector and the public sector. In the case of public facilities, it is common for the related ministerial departments or public corporations to take full responsibility from planning and design through to the procurement of equipment and materials and the actual execution of works. Thus, because the agencies involved in public construction have a certain amount of power and influence, large construction projects can be carried out, however, public agencies rarely become involved in private construction projects.

Regarding the construction of facilities to be borne by the Sri Lanka side for the Project, SLRC shall assume responsibility from design through to execution.

(4) Concept Regarding Utilization of Local Contractors and Equipment and Materials

Regarding the basic and detailed design for equipment installation work in the Project, work shall not be consigned to local contractors or consultants. Furthermore, because the installation work will take place within existing buildings, the Japanese consultants shall obtain from SLRC detailed design documents, etc. relating to the facilities for use in the detailed design.

(5) Concept Regarding the Operation and Maintenance Capacity of the Implementing Agency

The broadcasting facilities and equipment that were provided under past grant aid projects are somehow being maintained and operated despite having reached the stage of frequent breakdown occurrence.

Project equipment shall be selected and systems constructed to achieve compatibility with existing equipment, with consideration given to ease of operation, reliability and ease of maintenance. Furthermore, equipment must be selected with thought given to the easy procurement of maintenance and spare parts, to ensure that the equipment is maintained for permanent use.

(6) Concept Regarding the Setting of Facilities and Equipment Ranges and Grades

The quantities and grades of equipment to be provided under the Project shall be decided based on the prerequisite that replacement of deteriorated existing program production facilities at SLRC is the goal, and upon first validating the necessity, urgency and

appropriateness of the equipment. The minimum quantities of equipment shall be designed for upon carefully considering intentions for the expansion of program frames and enhancement of program contents within the future plans (broadcasting times, ratio of own program production, etc.) of SLRC. Regarding the scale of transmission facilities, bearing in mind the maintenance of stable transmitting functions, the design shall ensure the transmission capacity that was achieved immediately following past equipment provision is attained. Moreover, concerning resolution of the poor reception area on the outskirts of Kandy, the optimum plan including construction of Hantana Transposer Station shall be decided upon validating necessity and appropriateness based on the findings of the site survey.

Finally, regarding the Sinhala/Tamil language simultaneous broadcasting (multi-language broadcasting), which is one of the aims of the Project, upon validating the necessity and appropriateness of this, the range (news, etc.) of multi-language programs within the programming schedule of SLRC shall be set and the systems needed for introduction of multi-language broadcasting functions shall be selected.

(7) Concept Regarding Implementation Period

The Project has to be implemented in one term due to the limitations placed on it as a grant aid project of the Government of Japan. The consultants shall set the Project implementation period upon taking this time limitation, natural conditions in Sri Lanka and other circumstances into account.

2-3-2 Basic Design

(1) Overall Plan

Basic design revolving around the following points shall be carried out on the broadcasting equipment to be provided under the Project, based on the premise that the equipment is used to rehabilitate and upgrade existing equipment at SLRC.

- Renewal of transmission facilities shall be carried out at Pidurutalagala Main Transmitting Station and Primrose Hill Transposer Station, in order to maintain stable transmitting functions.

- A new transposer station shall be built at Hantana to resolve the area of poor reception on the outskirts of Kandy (the Sri Lanka side shall be responsible for the construction works on the station building and steel tower, etc.).

- Sinhala/Tamil language simultaneous broadcasting (multi-language broadcasting) centering around news programs shall be introduced.

- The outside broadcast van shall be completely renewed to maintain outside broadcast functions and enable SLRC to fulfill one of its important duties as the state broadcaster.

- Broadcasting equipment provided in past grant aid projects (main control room facilities, studio and sub-control room facilities, editing room facilities, etc.) shall undergo partial renewal.

- The Project shall include the small-scale provision of digital equipment for post production, in order to lay the foundations for the total digitization of broadcasting facilities being planned by SLRC.

Based on the above, the overall plan conceptual drawing is shown in Figure 2-3-1. Furthermore, in the case where Sinhala/Tamil language simultaneous broadcasting is introduced, the broadcasting equipment to be partially renewed through the Project shall possess multi-language broadcasting functions. The conceptual drawing of the plan of equipment for multi-language broadcasting is shown in Figure 2-3-2.
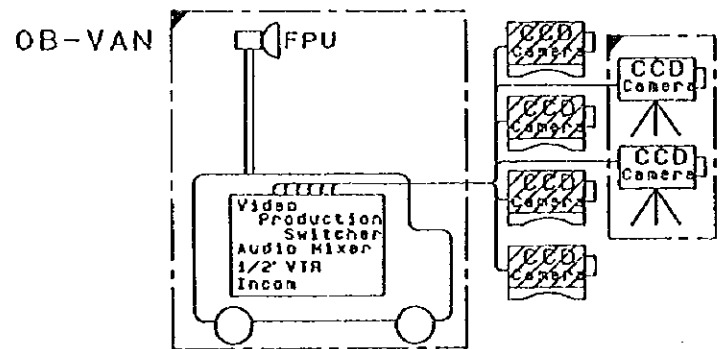
Colombo Broadcasting Center

-----Existing Equipment-----

Carrying type
  Program Relay Equipment
Small OB-VAN Equipment
Character Generator, etc.

---Existing Equipment---

VTR & Telecine Equipment
ENG Equipment
Program Relay Equipment
Power Supply Equipment
Relay Equipment, etc.

----Radio Control Room----

STL TX

Micro Wave

STL RX | 20kW TV Transmitter (CH5)

NICAM Encoder & Modulator

Engine Generator

Pidurutalagala Main Transmitting Station

Pidurutalagala Main Transmitting Station TV Wave

○ Suriyakanda Transposer Station
○ Namunukla Transposer Station

----Editing Room----

Midium Editing Room No.1
  Analog 1/2' AB Rool Editing Equipment

Small Editing Room No.4
  Analog 1/2' VTR Editing Equipment

Small Editing Room No.2
  Analog 1/2' AB Rool Editing Equipment

Small Editing Room No.5
  Analog 1/2' VTR Editing Equipment

Small Editing Room No.3
  Analog 1/2' VTR Editing Equipment

---Master Control Room---

Master Switcher | Routing Switcher
Automated Program Control System (APC) | Clock System
Digital 1/2' VTR 2 sets | Sync Signal Generator
Frame Synchro-nizer | Caption Scanner
Video Time Generator | UPS

----Post Production----

Digital 1/2' ABC-1 Editing Equipment
Video Production Switcher
Audio Mixer
Computer Graphics (CG)

Shinhala/Tamil Language Simultaneous Broadcasting Service

Pidurutalagala Main Transmitting Station TV Wave

200kW TV Transposer (CH10) Engine Generator

Hantana Transposer Station

Dissolution of Poor Reception Area in the Outskirts of Kandy

No.3 Studio·Sub Control System

Sub-Control Equipment
CCD Camera | Tube Camera
CCD Camera | Tube Camera
Tube Camera

No.2 Studio·Sub Control System

Sub-Control Equipment
  Video Production Switcher
  Audio Mixer
  Analog 1/2' VTR 2 sets

CCD Camera
CCD Camera
CCD Camera
Announce Booth

No.1 Studio. Sub Control System

Sub-Control Equipment
  Analog 1/2' VTR 2 sets

CCD Camera
CCD Camera
CCD Camera
CCD Camera

Hantana Transposer Station TV Wave

Primrose Hill Transposer Station

5W TV Transposer (CH39) Engine Generator

OB-VAN

FPU
CCD Camera
CCD Camera
Video Production Switcher Audio Mixer 1/2' VTR Incom
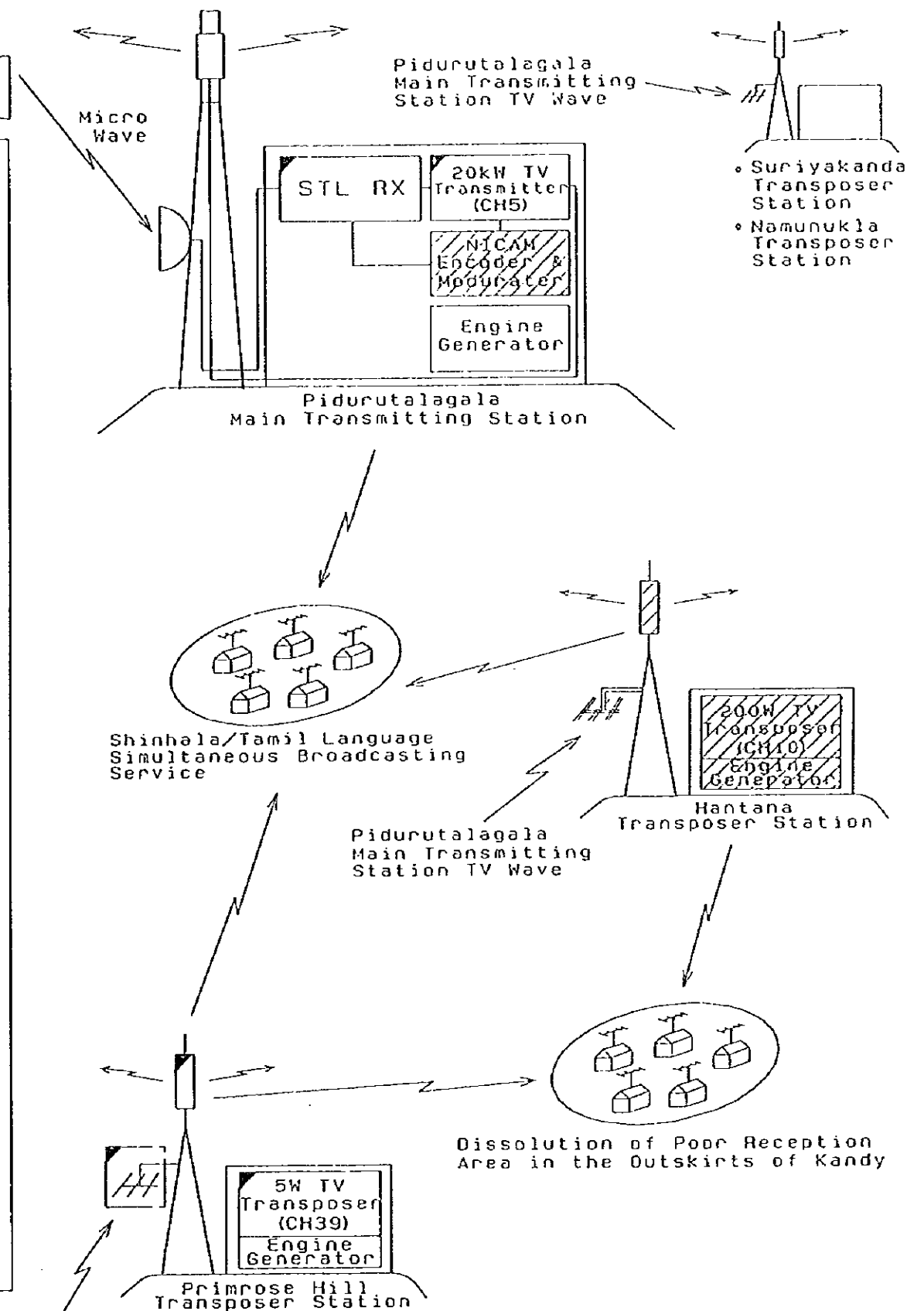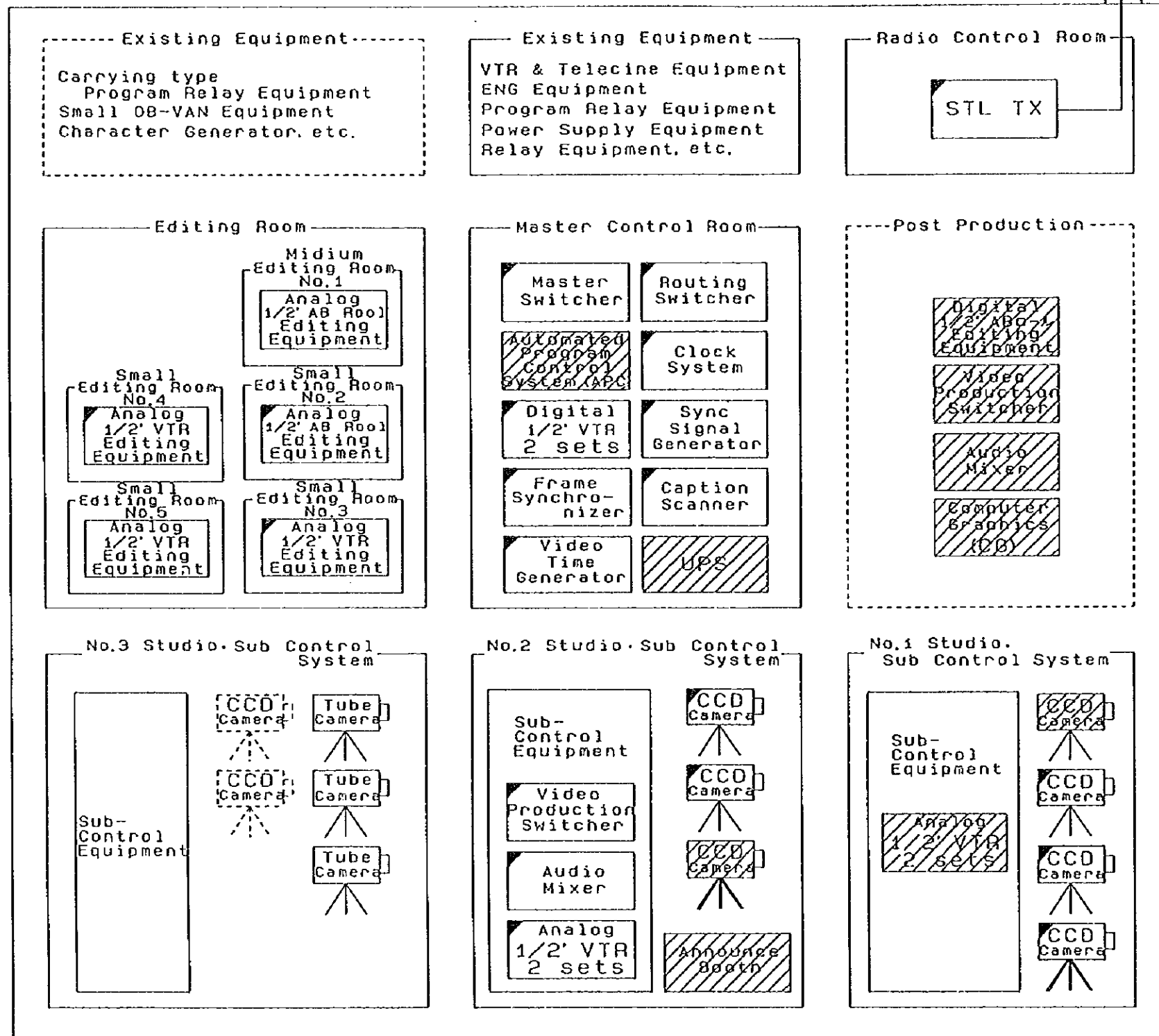CCD Camera
CCD Camera

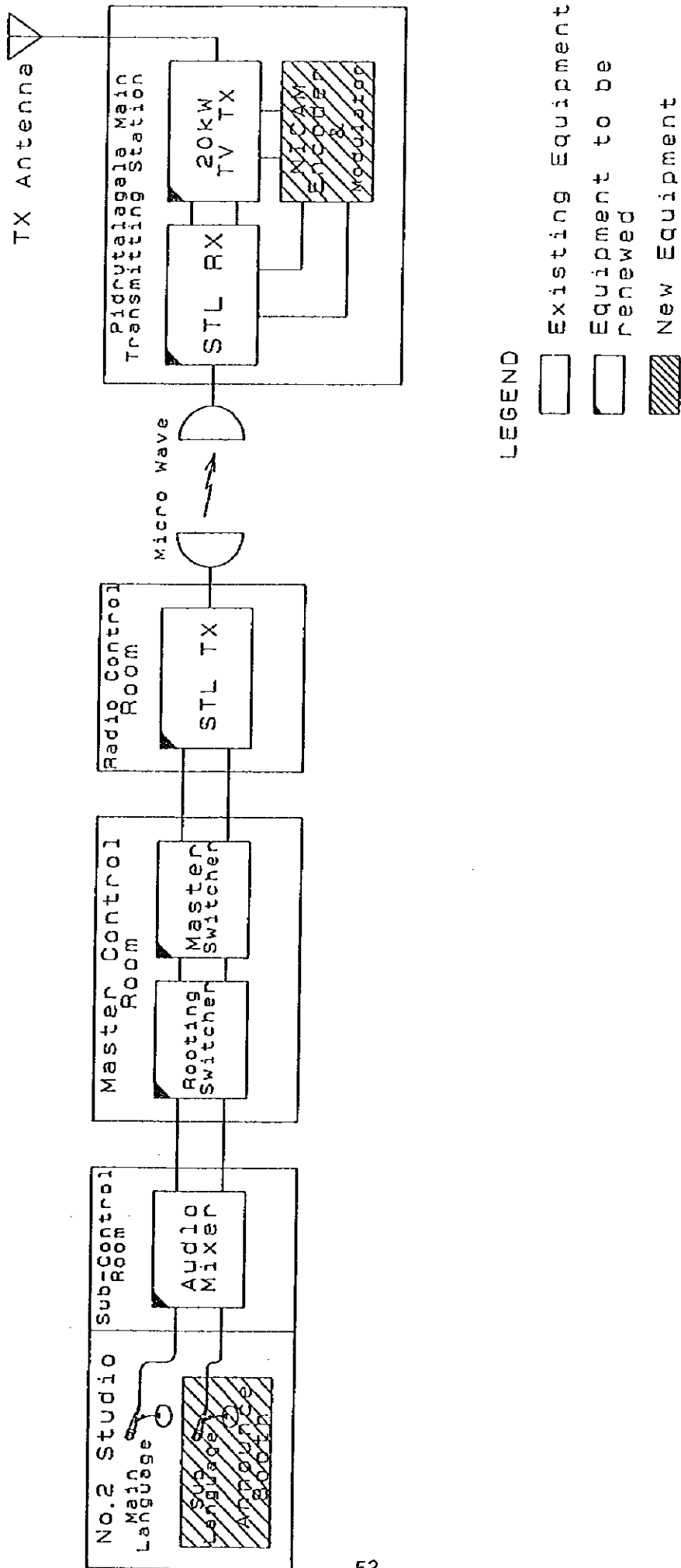## Figure 2-3-1 Overall Plan Conceptual Drawing

LEGEND

——— Existing Equipment (Provided under Past Grant Aid)

------ Existing Equipment (Not Provided under past Grant Aid)

Equipment to be renewed

New Equipment to be realy installed

Figure 2-3-2 Conceptual Drawing of the Plan of Equipment for Multi-Language Broadcasting

Table 2-3-1 The Results of the Equipment Diagnosis
based on the Past Grant Aid Equipment List

Results of Diagnosis (○:Usable △:Frequent Failure ×:Out of use —:No Diagnosis)

Name of Equipment	Term of Providing	Number	Results of Diagnosis
A. Colombo Broadcasting Center			
1. Master Control Room		1 unit	
a. Video Master Switcher	First Stage	1 unit	△
b. Audio Master Switcher	First Stage	1 unit	△
c. Rooting Switcher	First Stage	1 unit	△
d. Sync Signal Generator	First Stage	2 units	△
e. Monitoring Equipment	First Stage	1 unit	△
f. Flying Spot Scanner	First Stage	1 unit	×
g. Frame Synchronizer	First Stage	1 unit	△
h. Clock System	First Stage	1 unit	△
i. 2 inch VTR	First Stage	2 units	×
j. 3/4 inch VTR	Second	2 units	○
k. System Converter	Stage	1 unit	○
l. Telecine Equipment	Second	2 units	○
m. Cinecorder	Stage	2 units	×
n. Audio Tape Recorder	First Stage	2 units	×
o. Disk Player	First Stage	1 unit	×
2. Studio No. 1 Sub Control Room		1 unit	
a. Studio Camera (Plumbicon Camera)	First Stage	3 units	×
b. Video Mixing Amplifier	First Stage	1 unit	△
c. Audio Mixer	First Stage	1 unit	△
d. Monitoring Equipment	First Stage	1 unit	△
e. Flying Spot Scanner	First Stage	1 unit	△
f. Lighting Equipment	First Stage	1 unit	○
g. Audio Tape Recorder	First Stage	2 units	△
h. Disk Player	First Stage	2 units	×
3. Studio No. 2 Sub Control Room		1 unit	
a. Studio Camera (Plumbicon Camera)	First Stage	2 units	×
b. Video Mixing Amplifier	First Stage	1 unit	△
c. Audio Mixer	First Stage	1 unit	△
d. Monitoring Equipment	First Stage	1 unit	△
e. Flying Spot Scanner	First Stage	1 unit	×
f. Lighting Equipment	First Stage	1 unit	○
g. Audio Tape Recorder	First Stage	2 units	△
h. Disk Player	First Stage	2 units	△

Results of Diagnosis (○:Usable △:Frequent Failure ×:Out of use —:No Diagnosis)

Name of Equipment	Term of Providing	Number	Results of Diagnosis
4. Studio No. 3 Sub Control Room		1 unit	
a. Studio Camera (Plumbicon Camera)	Second Stage	3 units	△
b. Video Mixing Amplifier		1 unit	○
c. Audio Mixer	Second Stage	1 unit	○
d. Monitor Equipment		1 unit	○
e. Flying Spot Scanner	Second Stage	1 unit	○
f. Audio Tape Recorder		2 units	△
g. Disk Player	Second Stage	1 unit	△
h. Lighting Equipment		1 unit	○
5. Post Production		1 unit	
a. Video Mixing Amplifier	First Stage	1 unit	△
b. Audio Mixer	First Stage	1 unit	△
c. Monitor Equipment	First Stage	1 unit	△
d. 3/4 inch VTR	First Stage	2 units	△
e. Audio Tape Recorder	First Stage	2 units	△
f. Disk Player	First Stage	2 units	△
6. Editing Room(No. 1~No. 5)		1 unit	
a. AB roll Editing Equipment for 3/4 inch VTR	Second Stage	1 unit	×
b. Editing Equipment for 3/4 inch VTR		4 units	△
7. News Gathering Equipment		1 unit	
a. Portable Camera(Plumbicon Camera)	First Stage	2 units	○
b. Portable Camera built in VTR(Plumbicon Camera)	Second Stage	1 unit	○
c. 3/4 inch VTR		2 units	○
d. Monitor Equipment	First Stage	1 unit	○
8. OB Van		1 unit	
a. Studio Type Camera(Plumbicon Camera)	First Stage	2 units	×
b. Video Mixing Amplifier	First Stage	1 unit	×
c. Audio Mixer	First Stage	1 unit	×
d. Monitoring Equipment	First Stage	1 unit	×
e. Sync Signal Generator	First Stage	2 units	△
f. 2 inch VTR	First Stage	1 unit	×
g. FPU(Transmitter & Receiver)	First Stage	1 unit	△
h. Intercom System	First Stage	1 unit	△
i. Engine Generator	First Stage	1 unit	△
9. Others		1 unit	
a. Maintenance Equipment	First Stage	1 unit	△
b. Power Supply Equipment	First Stage	1 unit	○
c. Air Conditioning Equipment	First Stage	1 unit	○

Results of Diagnosis (○:Usable △:Frequent Failure ×:Out of use —:No Diagnosis)

Name of Equipment	Term of Providing	Number	Results of Diagnosis
B. Transmitting Station			
1. Pridrutalagala Main Transmitter Station		1 unit	
a. 20kW TV Transmitter	First Stage	1 unit	△
b. 125kVA Engine Generator	First Stage	1 unit	○
c. STL Transmitter & Receiver	First Stage	1 unit	△
d. Transmitting Antenna	First Stage	1 unit	○
e. Transmitting Tower	First Stage	1 unit	○
f. Vector Scope	First Stage	1 unit	×
g. Waveform Monitor	First Stage	1 unit	×
2. Primrose Hill Transposer Station		1 unit	
a. 50W TV Transposer	First Stage	1 unit	△
b. 3kVA Engine Generator	First Stage	1 unit	○
c. Transmitting Antenna	First Stage	1 unit	△
d. Transmitting Tower(30m high)	First Stage	1 unit	○
e. Oscilloscope	First Stage	1 unit	○
3. Others			
a. Kokavil Transmitting Station	First Stage	1 unit	—
b. Madukanda Transposer Station	First Stage	1 unit	—
c. Suriyakanda Transposer Station	First Stage	1 unit	—
d. Namunukula Transposer Station	First Stage	1 unit	—

(2) Equipment Plan

The equipment provided by this project are shown on the table 2-3-2

Table 2-3-2   List of Equipment Provided

A. TV TRANSMITTER   1

   (Mt. Pidurutalagala Station)

      Comprising;

   1. VHF 20kW TV Transmitter (Channel 5)   2

   2. Output Coaxial Equipment   1

      a. U-Link panel (7ports)   1

      b. CIN Diplexer   1

      c. Divider   1

   3. Programme Input and Monitoring Equipment   1

4. NICAM Encoder and Modulator   1

5. Stereo Transient Limiter   1

6. NICAM Demodulator   1

7. TV Demodulator   1

8. Dehydrator   1

B. TV TRANSPOSER   1
(Primrose Hill Station)
    Comprising;

1. UHF 5W TV Transposer (Channel 39)   1
(Stand-by System)

2. Air Monitor Equipment   1

3. Transmitting Antenna   1
(4 Dipole Antenna 1 face 1 stage)

4. Receiving Antenna   1
(5-element Yagi Antenna for channel 10)

5. Spectrum Analyzer   1
(1 GHz with Tracking Generator)

C. TV TRANSPOSER   1
(Hantana Station)
    Comprising;

1. VHF 200W TV Transposer (Channel 10)   1
(Stand-by System)

2. Air Monitor Equipment   1

3. Transmitting Antenna   1
(4 Dipole Antenna 4 faces 1 stage)

4. Receiving Antenna   1
   (5-element Yagi for channel 5)

5. U-Link Panel   1

6. Dummy Load   1

7. Engine Generator (10 kVA)   1

8. Power Receiving and Distribution Unit   1

D. 7GHz TV STL SYSTEM   1
   Comprising;

   1. 7GHz 10W STL TX   1

   2. 7GHz STL RX   1

E. MASTER CONTROL ROOM EQUIPMENT   1

   1. Master Switcher   1
      a. Master Switcher (local) Analog 16 input   1
      b. Master Switcher (satellite) Analog 16 input   1

   2. Auto Programming Control System   1

   3. Routing Switcher   1
        Comprising;
      a. 32x32 Video Routing Switcher   1
      b. 32x32 Audio Routing Switcher   1
      c. Control Unit   1
      d. Remote Control Panel   3
      e. Emergency Video Switcher   2
      f. Emergency Audio Switcher   2
      g. 2:1 V/A Switcher   1

   4. Video Equipment   1
        Comprising;
      a. Time Generator (Local)   1

b. Time Generator (Satellite)	1
c. Logo Generator	1
d. Caption Scanner	1
e. 1/2-inch Digital VTR Player and Recorder	2
f. Frame Synchronizer	2
g. Video Distribution Amplifier	1
h. Video Processor	1
i. Video Jack Panel	1
j. System Rack	3
k. Video Console	1
5. Audio Equipment	1
Comprising;	
a. Digital Audio Tape Recorder (DAT)	1
b. Compact Disk Player (CD)	1
c. Audio Distribution Amplifier	1
d. Audio Limiter	2
e. Audio Jack Panel	1
6. Monitoring Equipment	1
Comprising;	
a. VE Monitor (14 inch)	2
b. Waveform Monitor	2
c. Vector Scope	2
d. 9-inch Input Color Monitor	18
e. 21-inch Color Monitor	2
f. Air Monitor (NICAM)	2
g. On Air Tally Logic	2
h. Audio Speaker with Amplifier	2
i. Monitor Shelf	1
7. Sync Signal Equipment	1
Comprising;	
a. Sync Signal Generator	2
b. Auto Changeover Unit	1
c. Video Distribution Amplifier	1
d. Test Signal Generator	1
8. Intercom System (10 Terminal)	1

9. Clock System (GPS)   1

          10. UPS (30kVA)   1

F. STUDIO NO.1   1

          1. Color Camera Chain   1
                  Comprising;
                  a. CCD Camera with 7-inch Viewfinder &
                     Triaxial Camera Adapter   4
                  b. Zoom Lens 20 Times   4
                  c. Pedestal   1
                  d. Camera Console   1

          2. Video Equipment   1
                  Comprising;
                  a. 1/2-inch Analog VTR (Play)   1
                  b. 1/2-inch Analog VTR (Record/Play)   1

G. STUDIO NO.2   1

          1. Color Camera Chain   1
                  Comprising;
                  a. CCD Camera with 7-inch Viewfinder &
                     Triaxial Camera Adapter   3
                  b. Zoom Lens 20 Times   3
                  c. Pedestal   1
                  d. Camera Console   1

          2. Video Equipment   1
                  Comprising;
                  a. Analog Production Switcher (18 input 2MK)   1
                  b. 1/2-inch Analog VTR (Play)   2
                  c. 1/2-inch Analog VTR (Record/Play)   1
                  d. Frame Synchronizer   2
                  e. Video Distribution Amplifier   1
                  f. Video Jack Panel   1
                  g. System Rack   3
                  h. Video Console   1

3. Audio Equipment   1

   Comprising;

   a. Audio Mixer   1

     (Analogue 16 inputs)

   b. Digital Audio Tape Recorder (DAT)   1

   c. Compact Disk Player (CD)   1

   d. Audio Distribution Amplifier   1

   e. Audio Jack Panel   1

4. Studio Equipment   1

   Comprising;

   a. Speaker with Amplifier   1

   b. Connection Box   1

   c. Operation Box for Microphone   2

5. Monitoring Equipment   1

   Comprising;

   a. VE Monitor (14 inch)   2

   b. Waveform Monitor   1

   c. Vector Scope   1

   d. 9-inch Input Color Monitor   16

   e. 21-inch Color Monitor   2

   f. Air Monitor   1

   g. On Air Tally Logic   1

   h. Speaker with Amplifier   1

   i. Monitor Shelf   1

6. Sync Signal Generator   1

   Comprising;

   a. Sync Signal Generator   2

   b. Auto Change over unit   1

   c. Video Distribution Amplifier   1

7. Announce Booth   1

   a. Microphone and Stand   1

   b. Speaker with Amplifier   1

   c. Operation Box for Microphone   1

   d. Announce Desk   1

H. POST PRODUCTION   1

   1. Digital Production Switcher (16 input 2MK)   1

   2. Digital Video Effect (3D)   1

   3. Analog Audio Mixer (12 input)   1

   4. 1/2-inch AB Roll Editing Equipment   1
      Comprising;
      a. 1/2-inch Digital VTR (1 out of 2 players is with DT)   2
      b. 1/2-inch Digital VTR (Player and Recorder)   1
      c. Editing Control   1
      d. Color Monitor (14 inch)   2
      e. Speaker with Amplifier   1

   5. Computer graphics   1

I. EDITING ROOM   1

   1. Editing Room No.2 (1/2-inch AB Roll)   1
      a. 1/2-inch Analog VTR (Play)   1
      b. 1/2-inch Analog VTR (Play with DT)   1
      c. 1/2-inch Analog VTR (Play/Record)   1
      d. Video Switcher   1
      e. Audio Mixer   1
      f. Editing Control Unit   1
      g. Color Monitor (14 inch)   3
      h. Table and Chair   1

   2. Editing Room No.3 & No.4   1
      a. 1/2-inch Analog VTR (Play)   2
      b. 1/2-inch Analog VTR (Play/Record)   2
      c. Editing Control Unit   2
      d. Color Monitor (14 inch)   4
      e. Table and Chair   2

J. OB VAN   1

   1. Field Color Camera Chain   1
      Comprising;
      a. Studio CCD Camera with 7 inch View finder &
         Triax Camera Adapter   2
      b. Zoom Lens (45 Times)   2
      c. Tripod Dolly   2

   2. Portable Camera Chain   1
      a. Portable CCD Camera with 5-inch Viewfinder &
         Triax Camera Adapter   4
      b. Zoom Lens (33 Times)   4
      c. Tripod Dolly   4

   3. Video Equipment   1
      Comprising;
      a. Analogue Video Switcher   1
      b. Digital Still Store   1
      c. Video Distribution Amplifier   1
      d. Video Jack Panel   1

   4. Audio Mixer   1
      Comprising;
      a. Audio Mixer   1
      b. Audio Distribution Amplifier   1
      c. Audio Jack Panel   1

   5. Monitoring Equipment   1
      Comprising;
      a. 9-inch Color Monitor   14
      b. Waveform Monitor/Vector Scope   1
      c. Air Monitor with Antenna   1
      d. Speaker with Amplifier   1
      e. Sync signal Generator   2
      f. Auto Changer Unit   1

   6. Microphone   6

7. Video and Audio Equipment   1

     Comprising;

     a. 1/2-inch Analog VTR (Record/Play with DT)   2

     b. Compact Disk Player   1

8. FPU System   1

     Comprising;

     a. Transmitter   1

     b. Receiver   1

     c. Parabolic Antenna   2

9. Communication System   1

     a. VHF Wireless Communication System   1

     b. Intercom Communication System   1

10. Vehicle   1

     Comprising;

     a. Vehicle   1

     b. Engine Generator (15kVA)   1

     c. Air Conditioner   1

     d. System Rack   1

     e. AVR   1

K. Measuring Equipment for Transmitter   1

     1. Oscilloscope (220MHz)   1

     2. Spectrum analyzer with tracking generator (3GHz)   1

     3. Video Test Signal Generator (PAL)   1

     4. Wave Monitor/Vector Scope   1

     5. Video Analyzer   1

L. Measuring Equipment for Studio   1

     1. Oscilloscope   1

     2. Audio Distortion Meter   1

     4. Wave Monitor/Vector Scope   1

2-3-3 Basic Design Drawing

CONTENTS OF DRAWINGS

1. Studio-1
2. Studio-2
3. Studio-3
4. Master Control Room
5. Post Production
6. Dubbing Room
7. Editing Rooms

Figure 1   Site planning at Colombo Studio Center

(UNIT:cm)

M	M	PR 600E

Bulk Tape
Eraser 6000

| VTR-1 |

TCS 90 | IEM 90 | Monitor

Interphone		ST-2	V-2
DUB	V-1	ST-2	V-1
Master	A-1	ST-1	V-2
Master	P-1	ST-1	V-1
Master	V-2	ST3-3
Master	V-1	ST3-2
VTR/TC ASGN-3		ST3-1
VTR/TC ASGN-2		STC-3
VTR/TC ASGN-1		STC-2
Clock		STC-1
Remote Control
Dubbing

Telecine-A

CSL-30 Cinesync

CSL-30 Cinesync

Monitor

Telecine-B

Tape Rack

VTR-2

VTR-3

VTR-4

VCR Editing Bench

BUV 820P

BVU 800P

BVU 800P

BVW 75P

VO 58M OP

M

BVT-200P

BVT 2000P

M

Still Store

M COM	M COM	M COM	ATR
BVU 950P			
	LQ 570		

|←— 150 —→|←— 60 —→|

| M | M |

| M Computr | Studio-2 CCU | Studio-1 CCU | Master Switcher | PC Console |

SLV-x2II
SLV-x2II
M
M
BVW 75P
BVT 800PS
BVC 800P

| M | M | BCB 75 |
| Computer | Editing Bench |

M

BUV 950P | BCB 75

Monitor Panel

Figure 2   Floor layout of Master Control Room in Colombo Studio Center
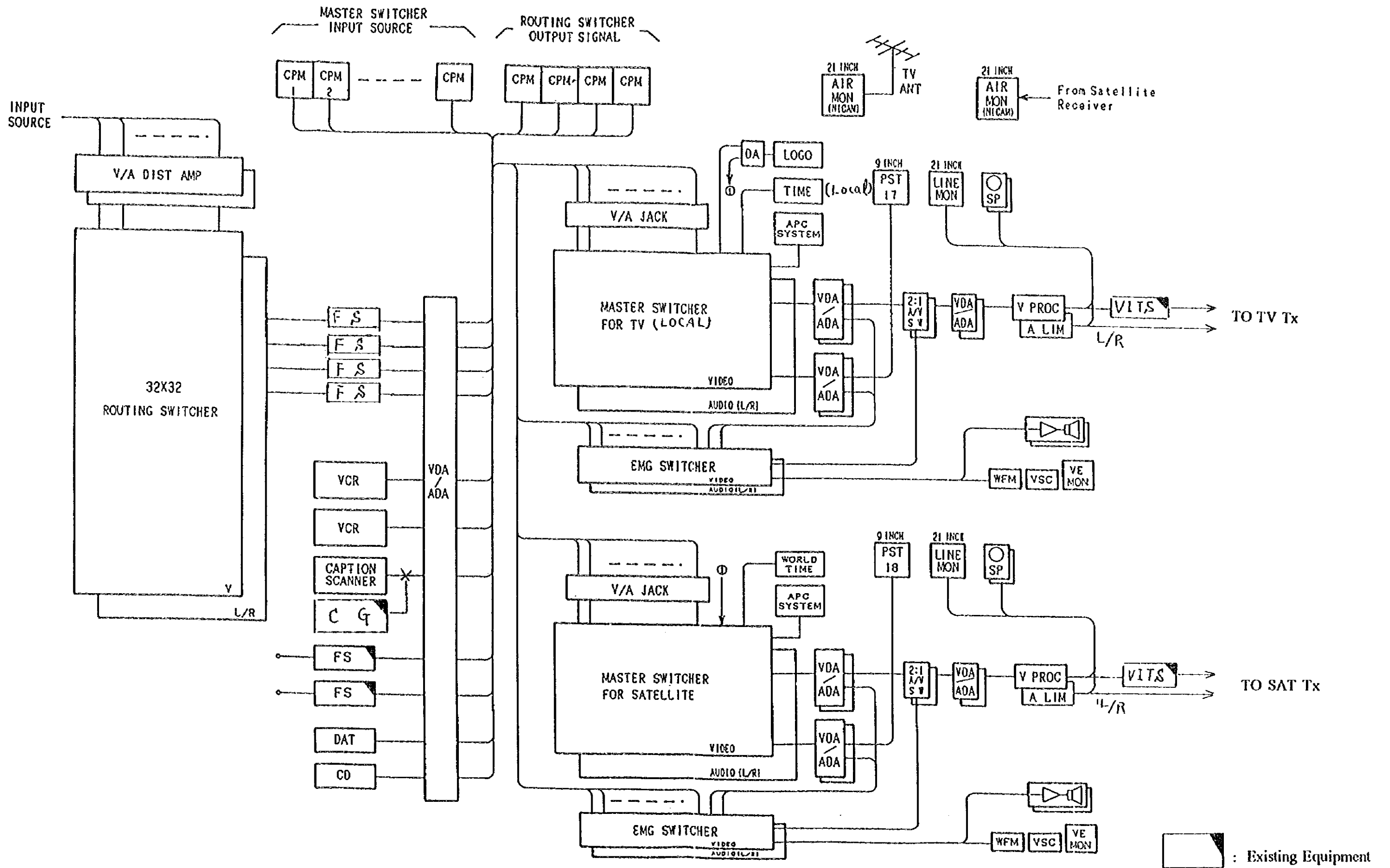
Figure 3   Video & Audio system diagram in Master Control Room in Colombo Studio Center
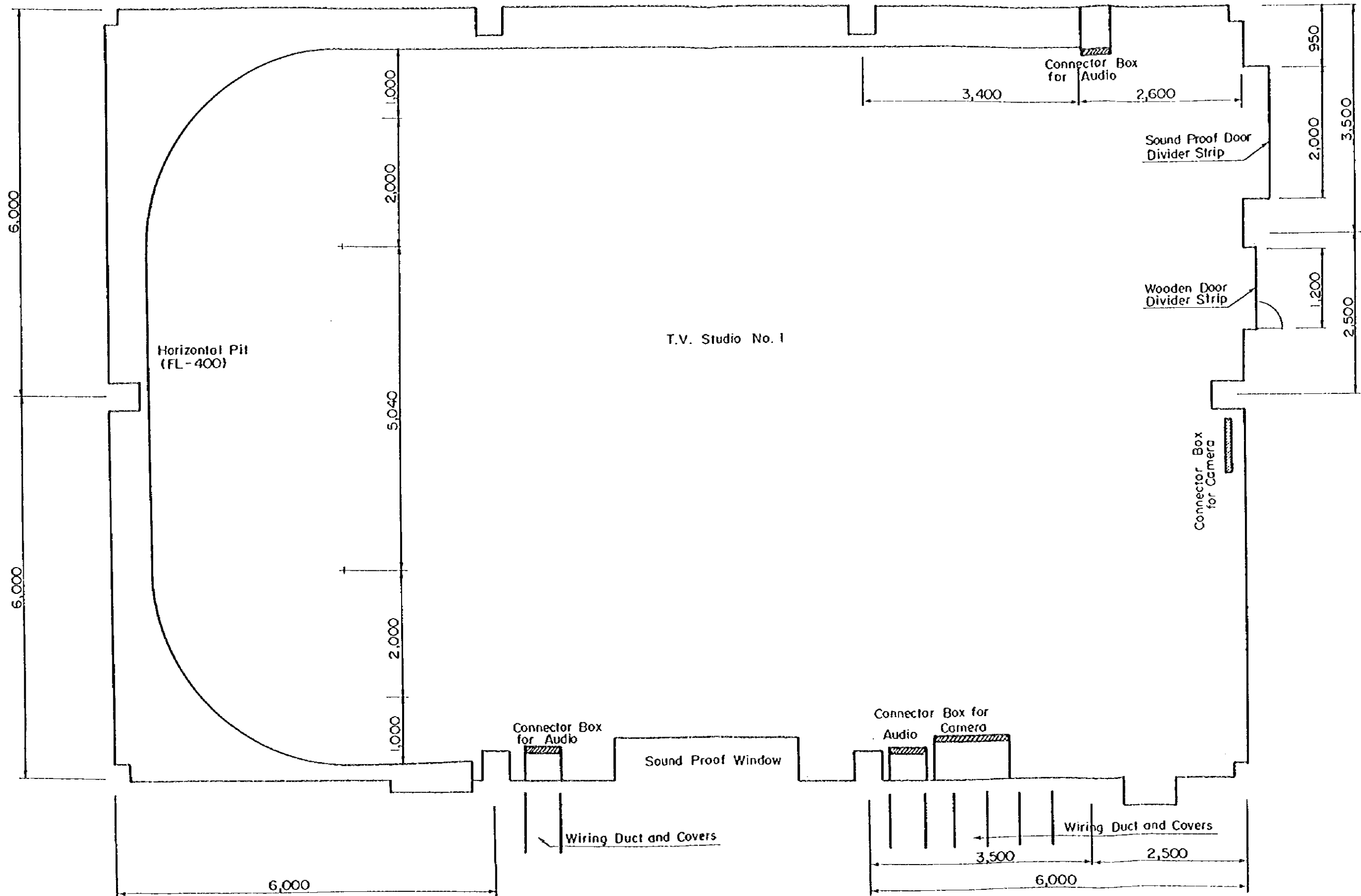
Figure 4　Top view of Studio-1 in Colombo Studio Center

(UNIT : cm)

Monitor Panel

Wireless Mic Con / Rec

Lighting Patch Board

120

420

PBO

Lighting Control

120

CCU

Video Engineer Console

90

Vision Mixer

150

Audio Mixer

160

ADR 2

ADR 1

ATR 1

ATR 2

FSS

Monitor

VCR
BVU Soop

TBC
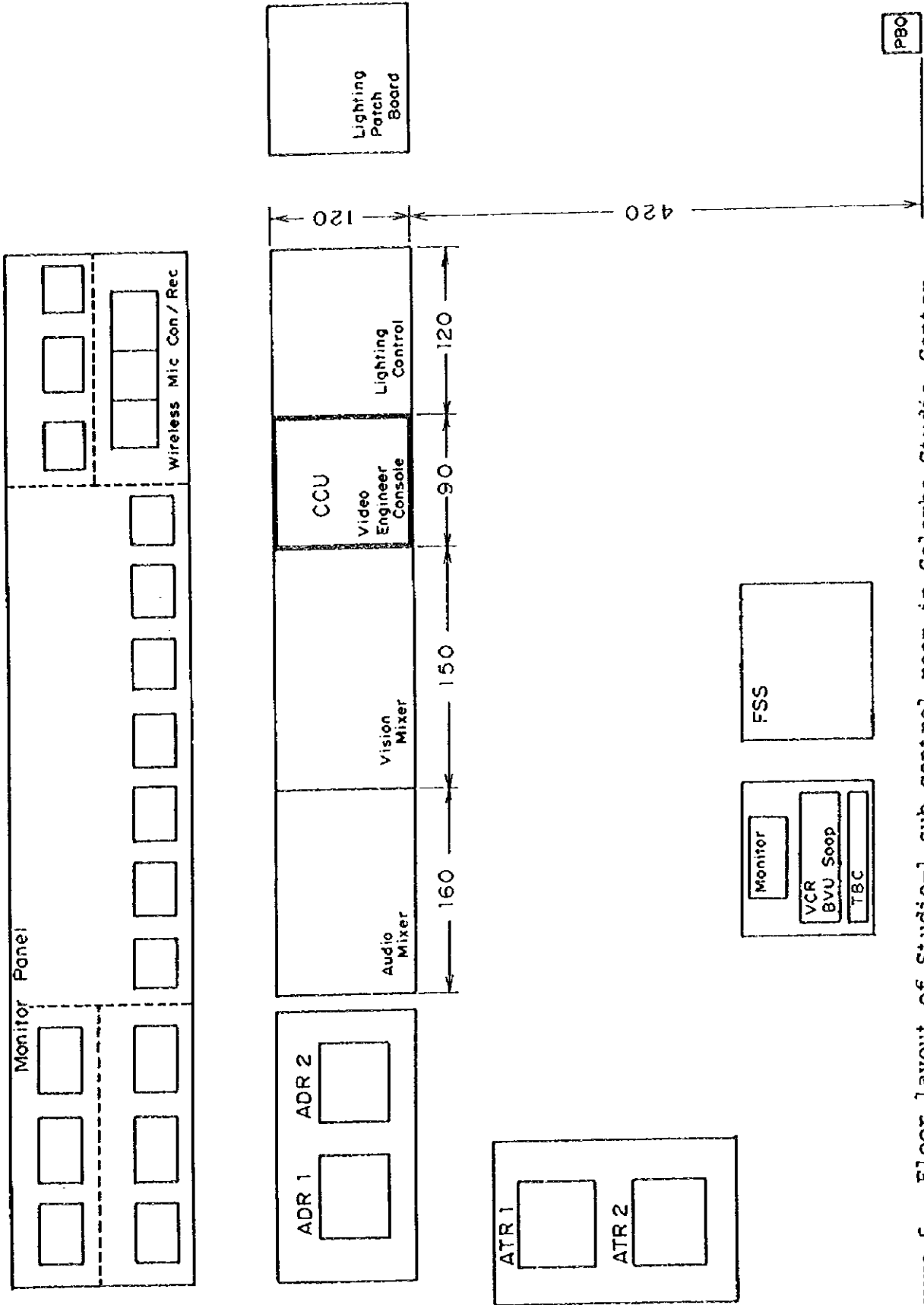
Figure 5   Floor layout of Studio-1 sub-control room in Colombo Studio Center
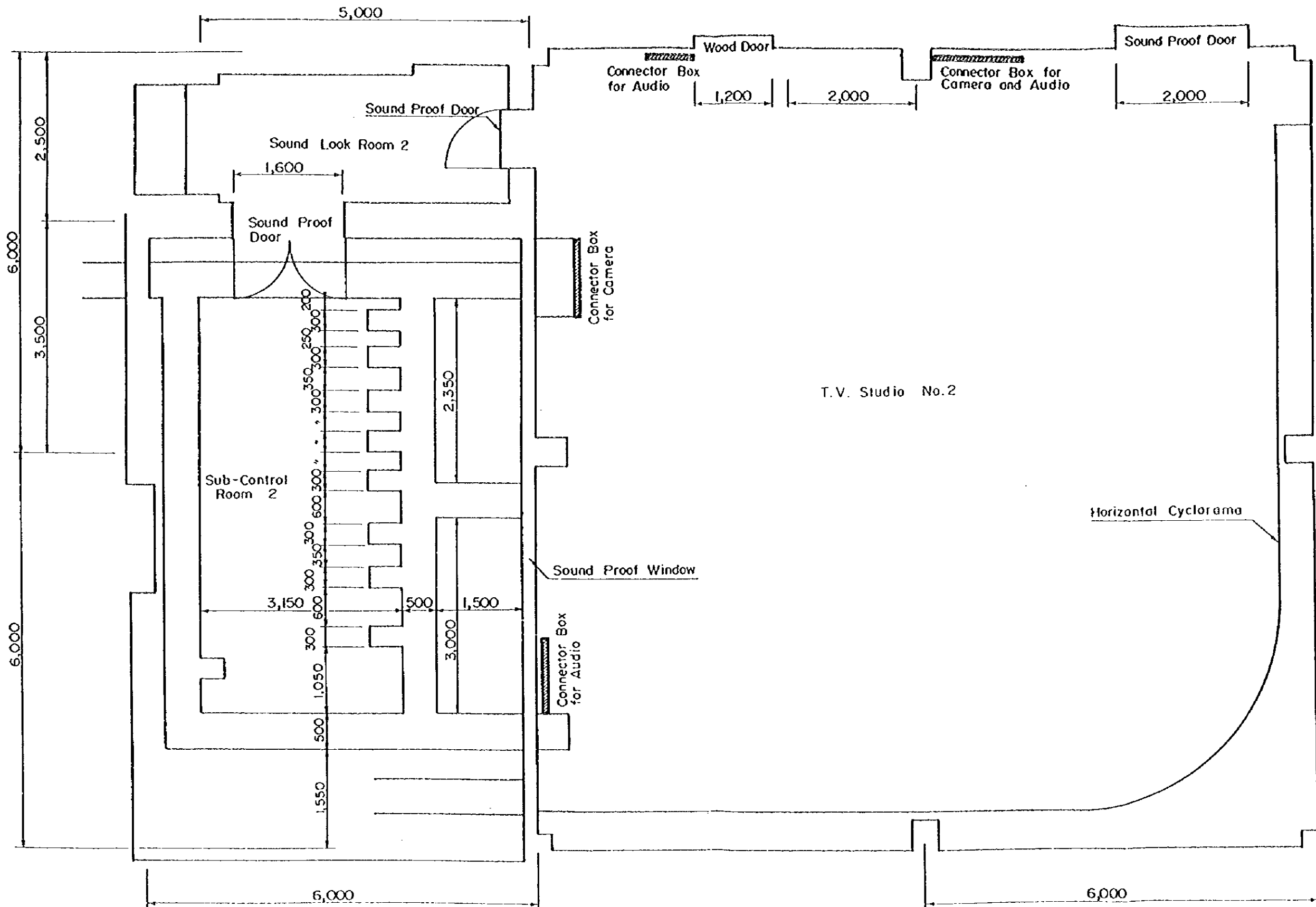
Figure 6   Top view of Studio-2 in Colombo Studio Center
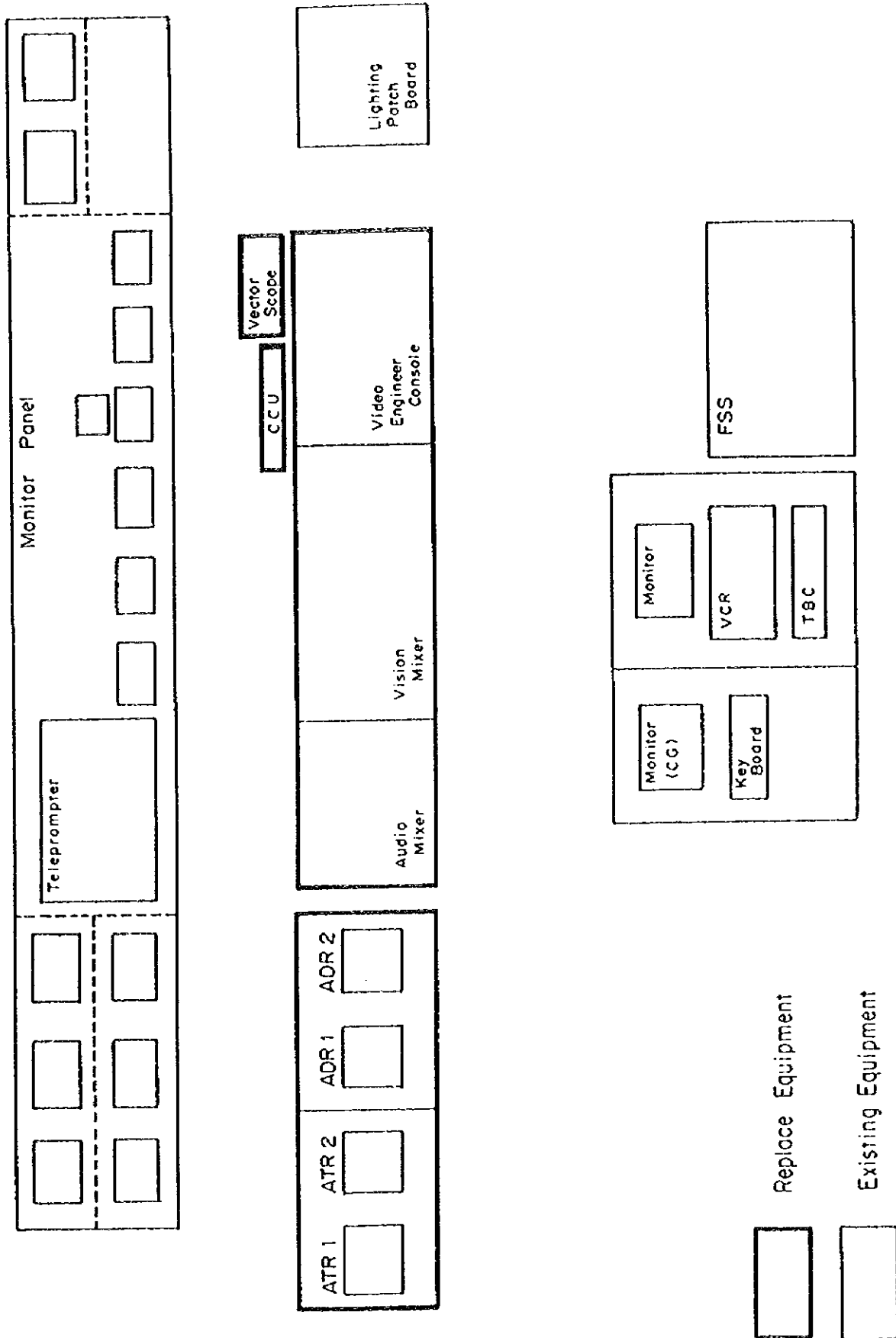
Figure 7 Floor layout of sub-control room of Studio-2 in Colombo Studio Center
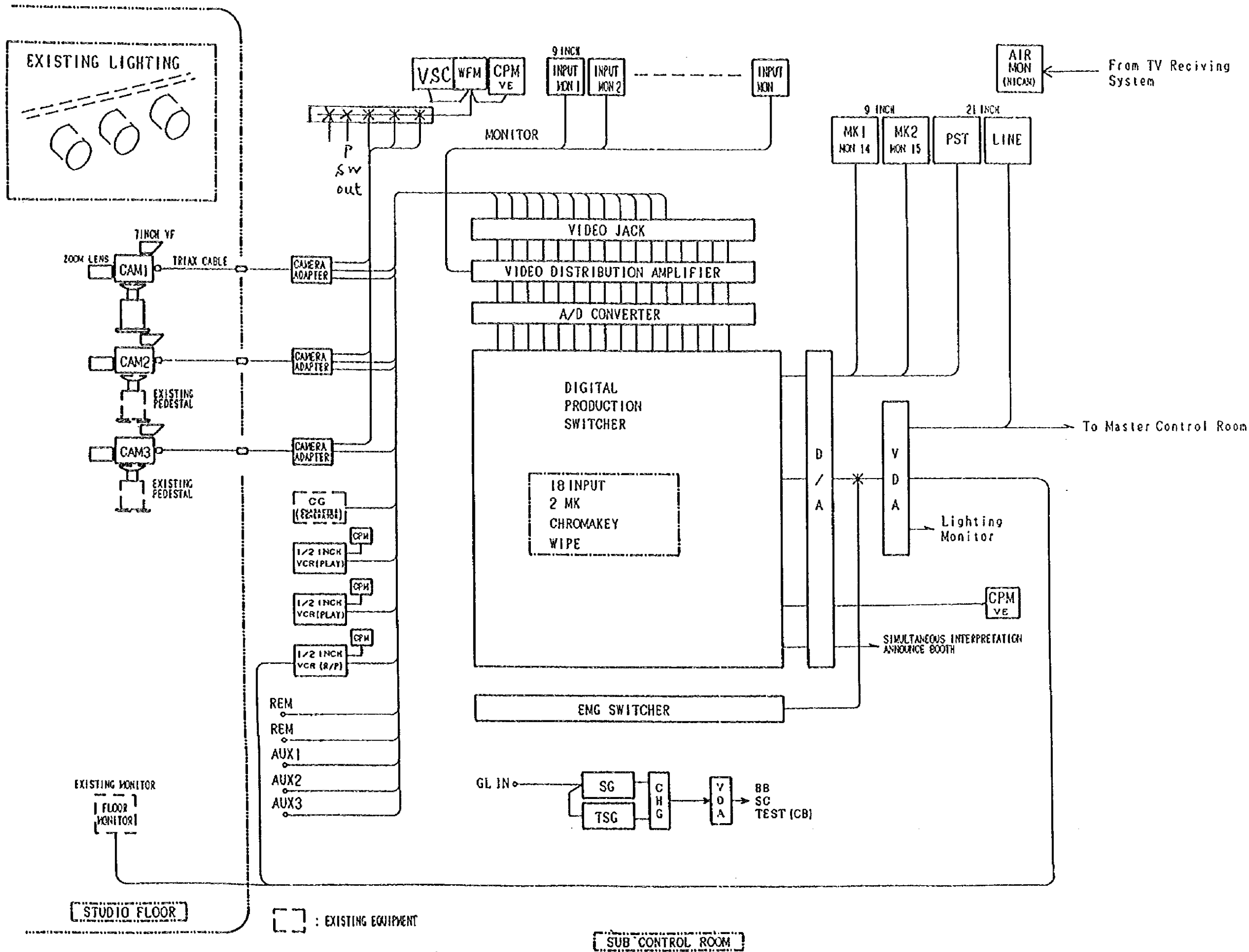
Figure 8   Block Diagram of Video System of Studio-2 sub-control room in Colombo Studio Center
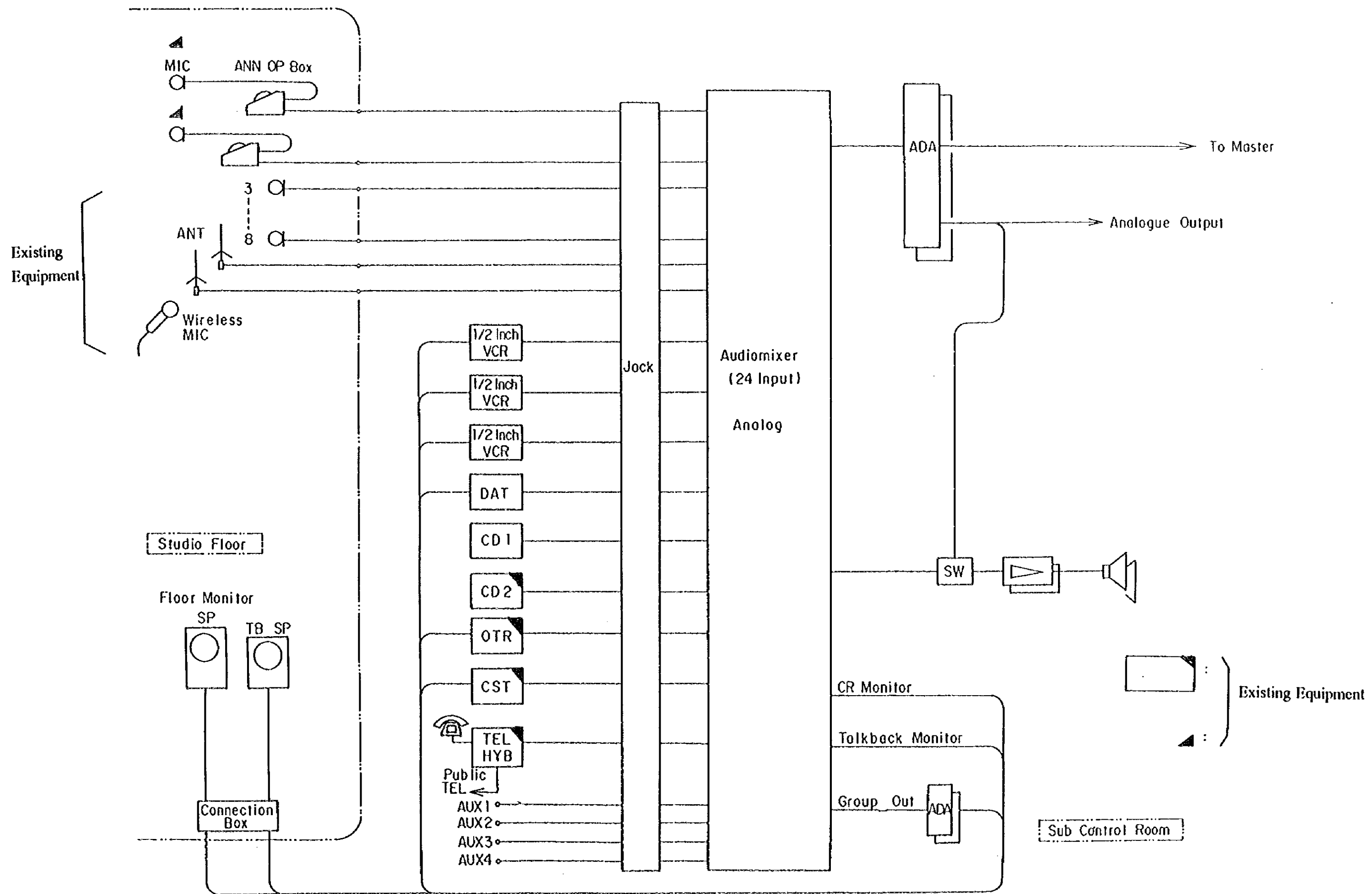
Figure 9   Block Diagram of Audio system of Studio-2 Sub-control Room in Colombo Studio Center   – 83 –
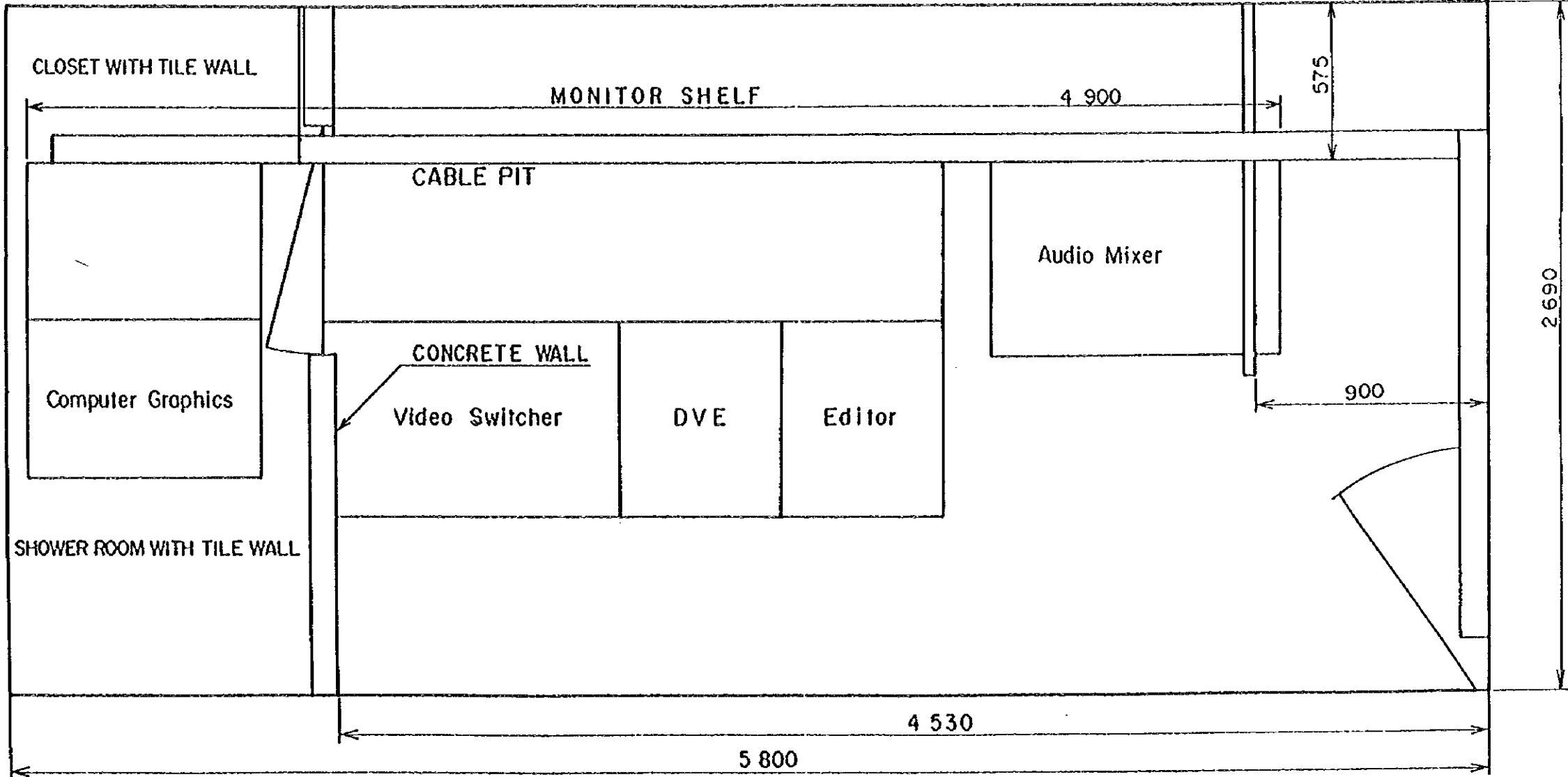
Figure 10   Floor Layout of Production Room in Colombo Studio Center
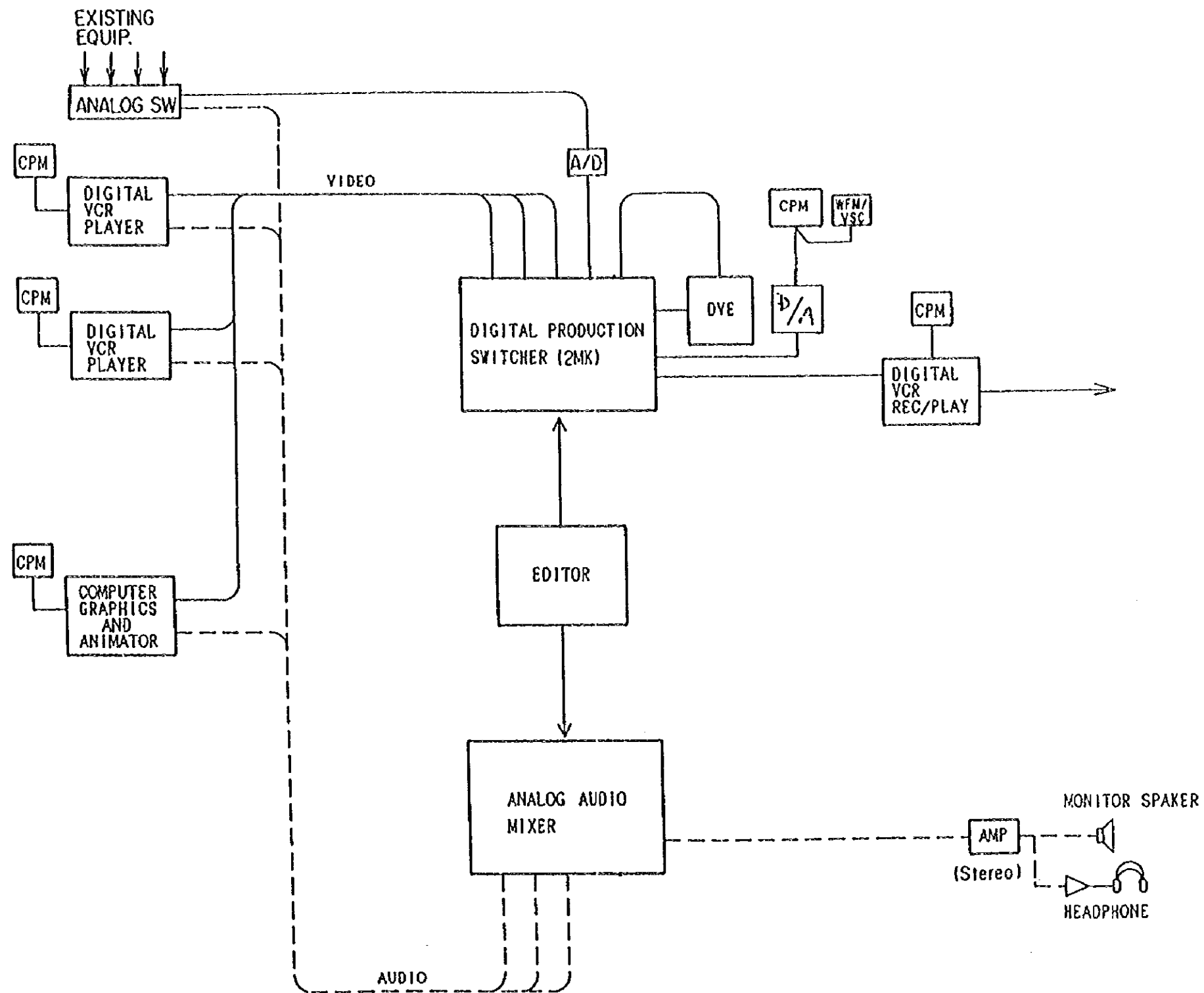
Figure 11 Block Diagram of Video & Audio system of Post Production Room in Colombo Studio Center
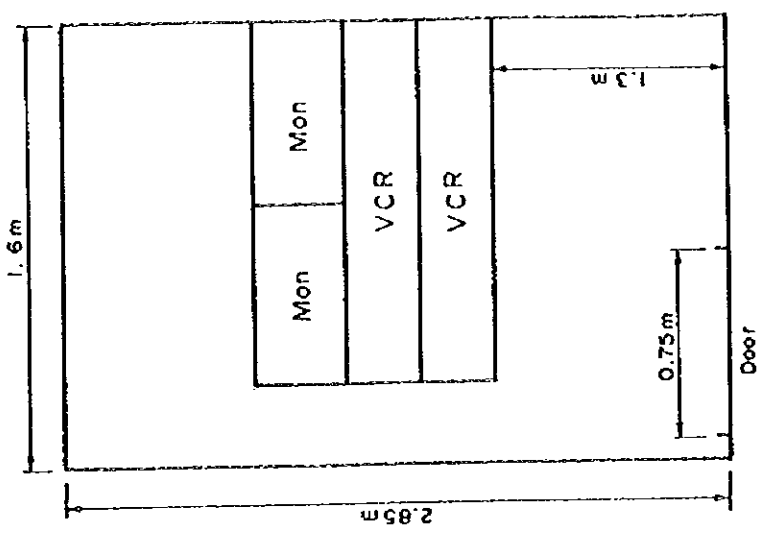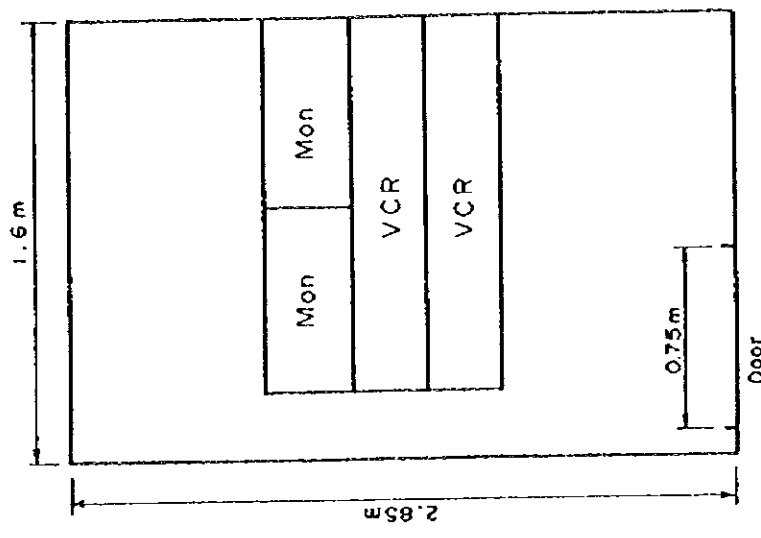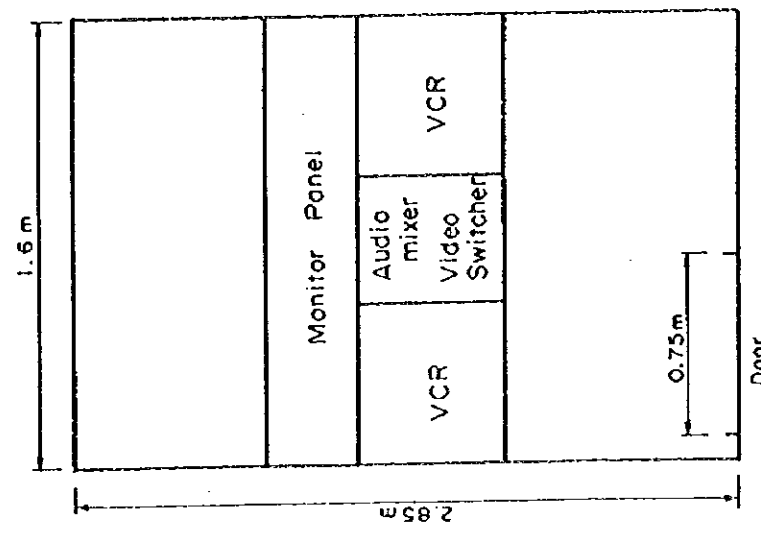
Figure 12 Floor layout of Editing Rooms in Colombo Studio Center
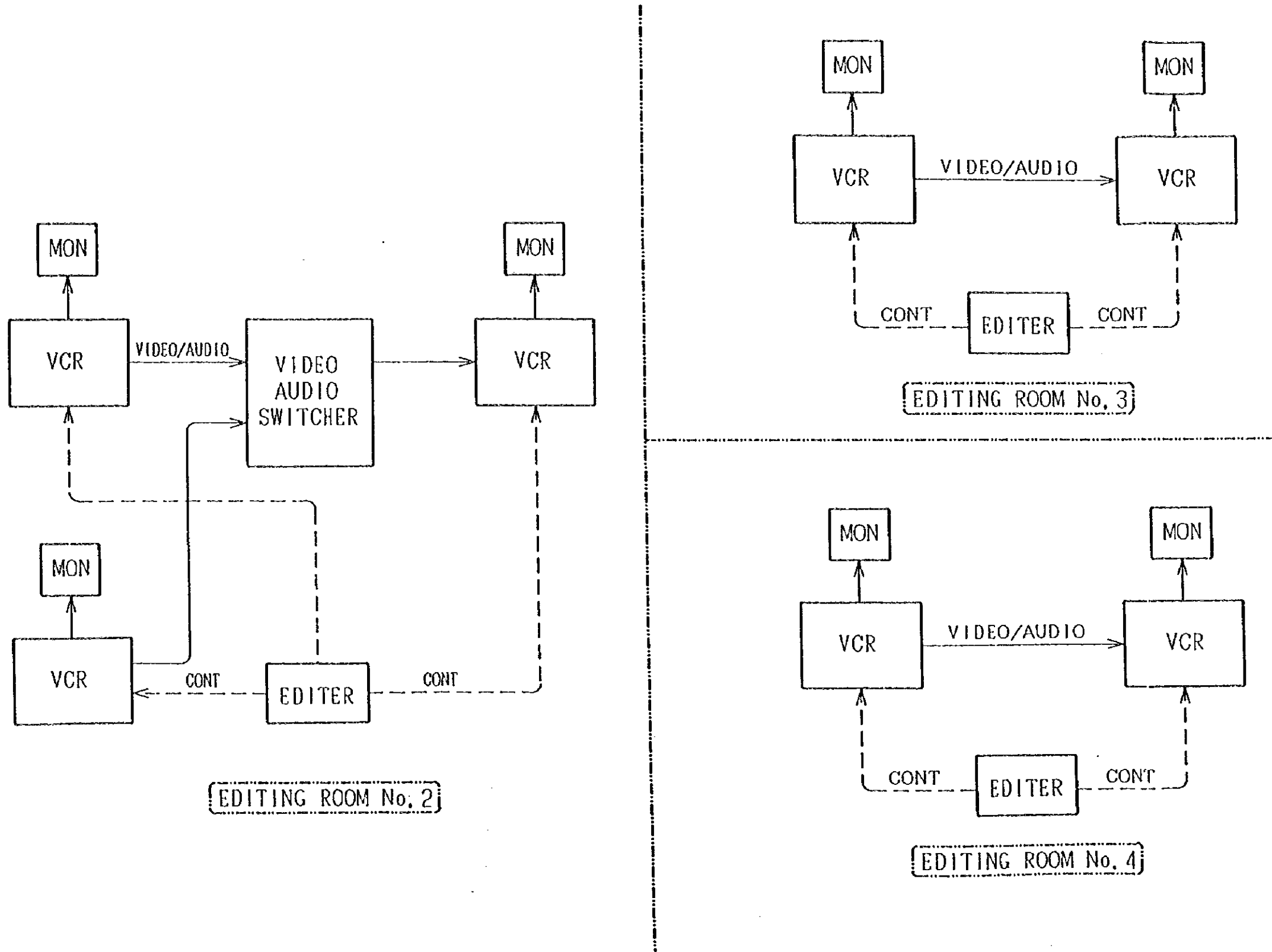
Figure 13 Block Diagram of Video & Audio system of Editing Rooms in Colombo Studio Center
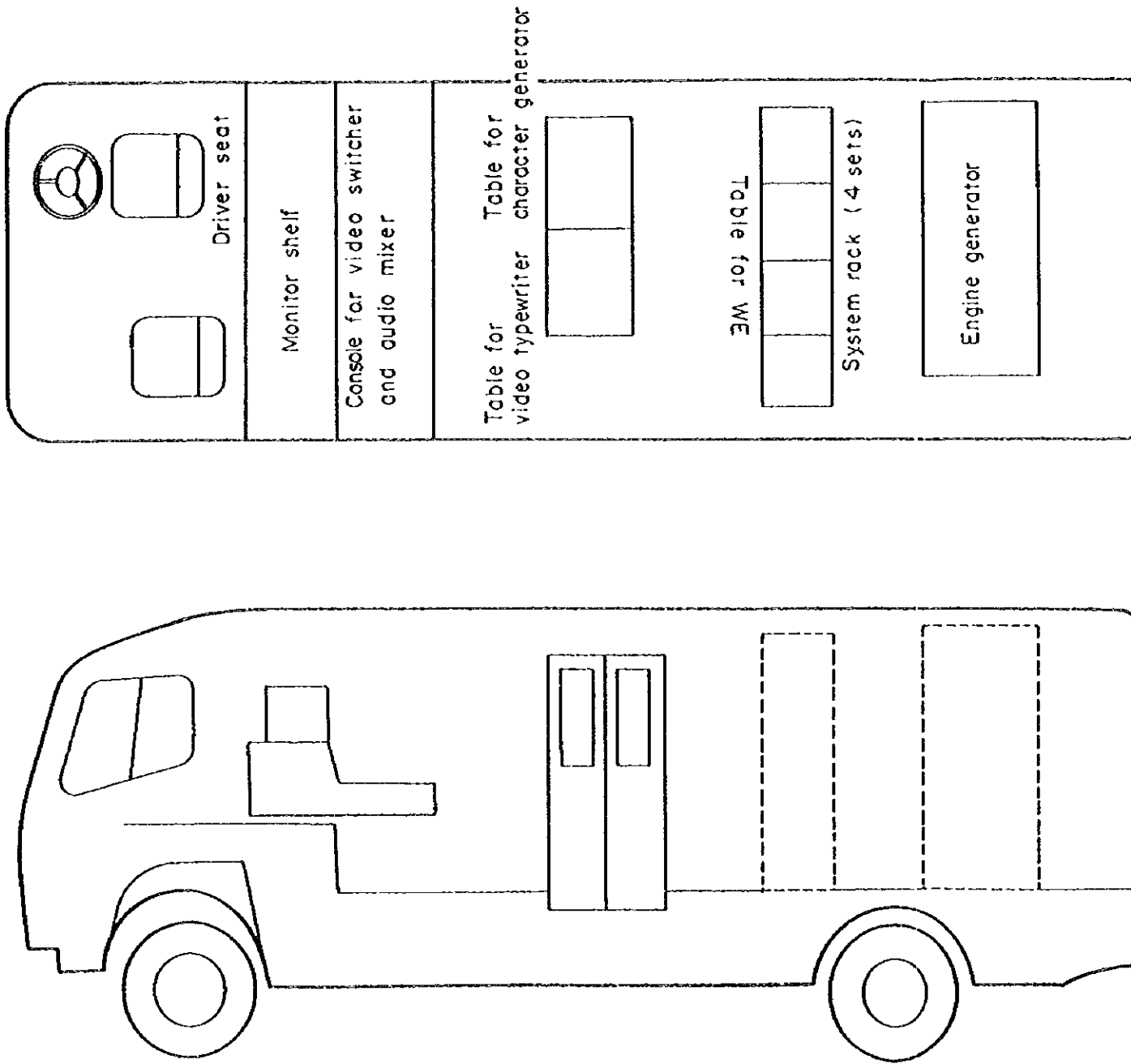
Figure 14 Site view of OB Van in Colombo Studio Center
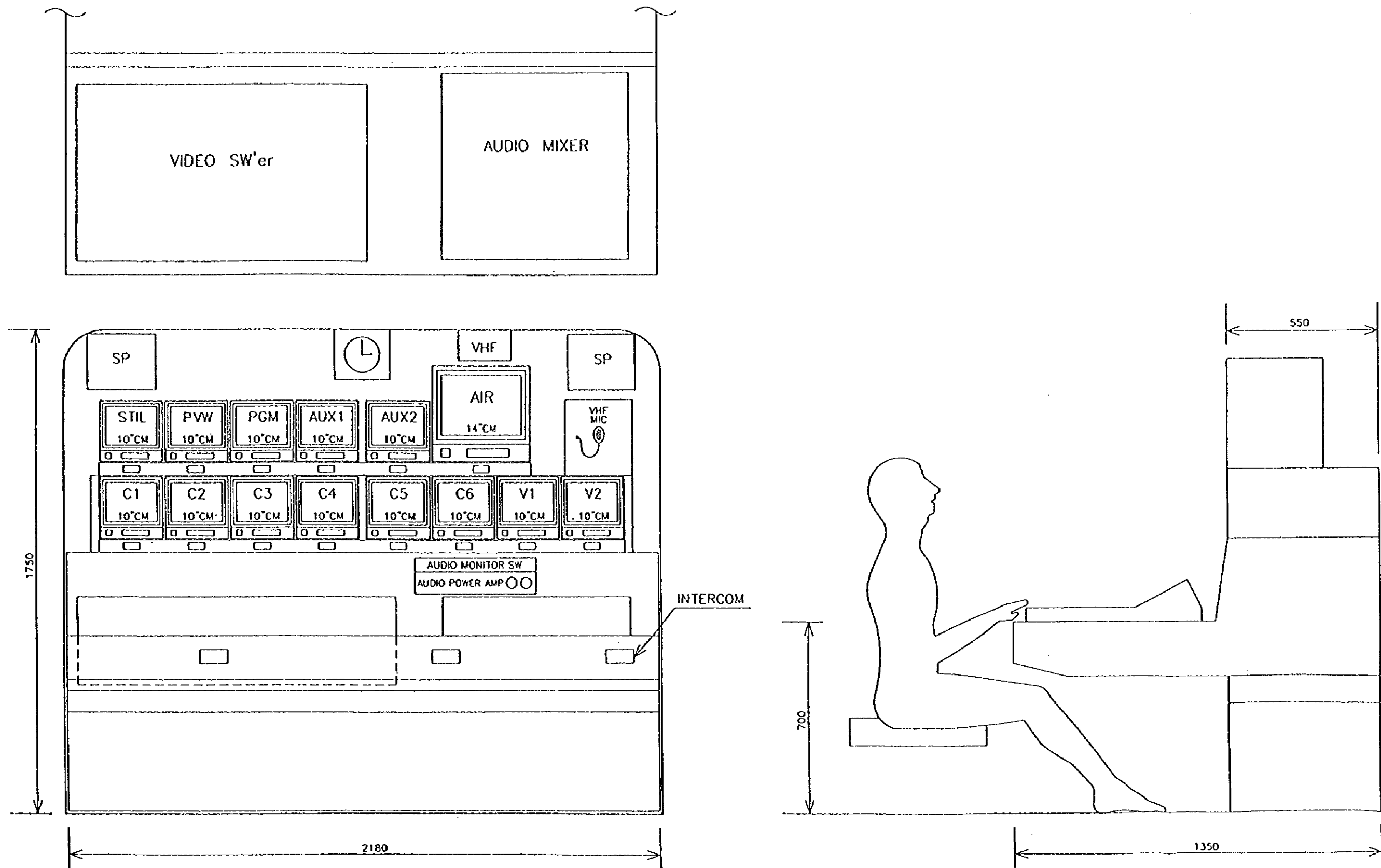
Figure 15 Sketch drawing of operation table of OB Van in Colombo Studio Center
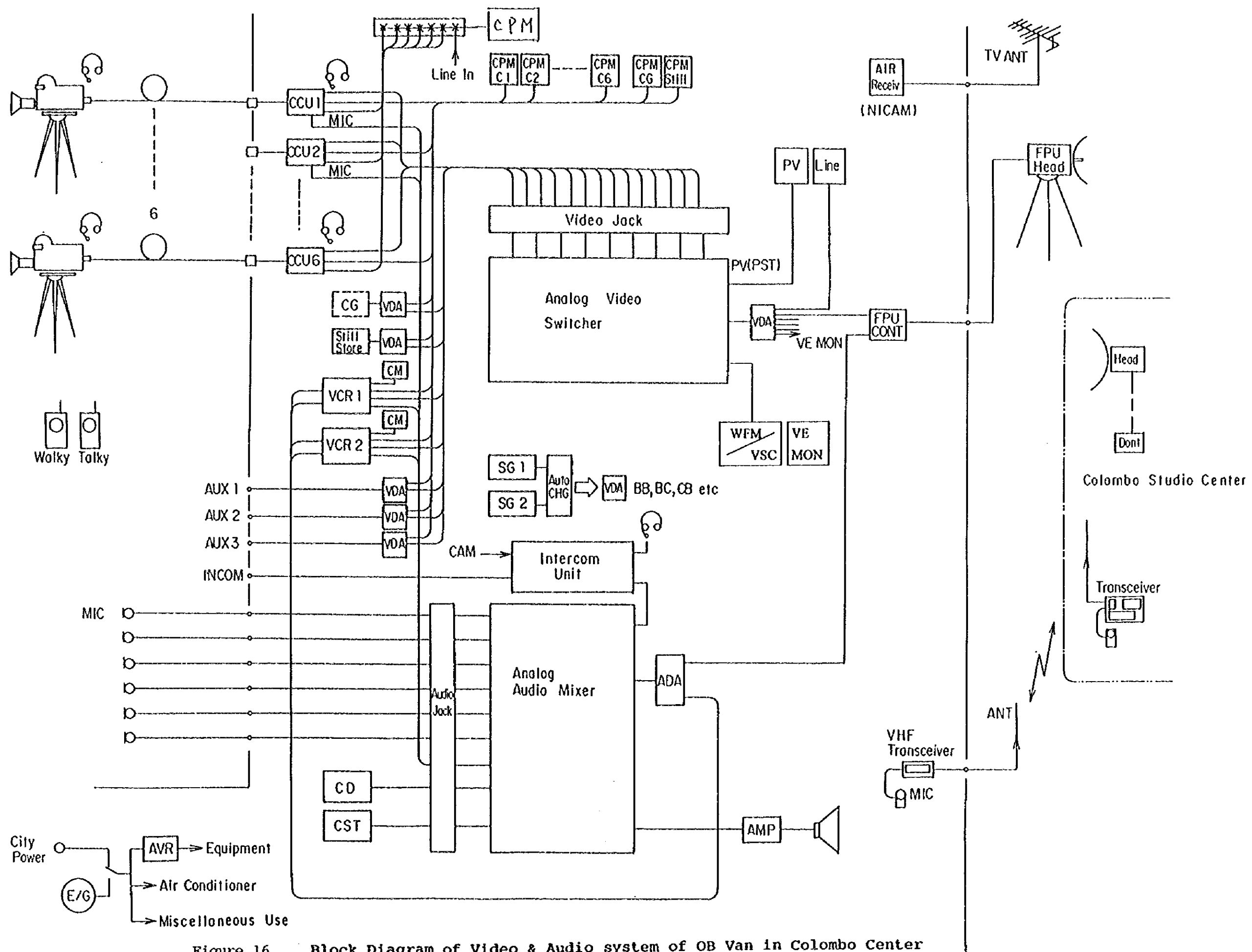
Figure 16   Block Diagram of Video & Audio system of OB Van in Colombo Center
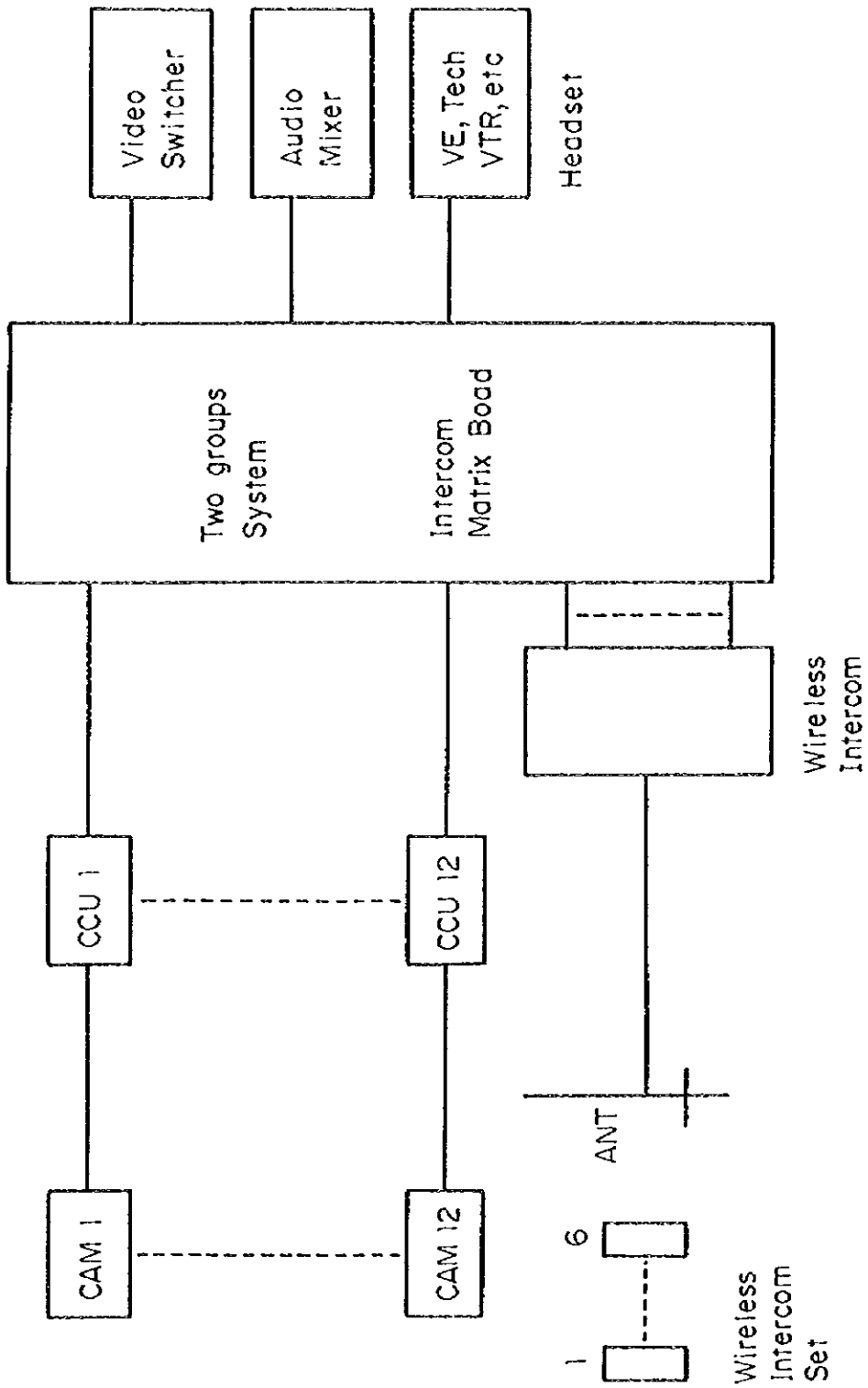
Figure 17   Intercom system diagram of OB Van in Colombo Studio Center
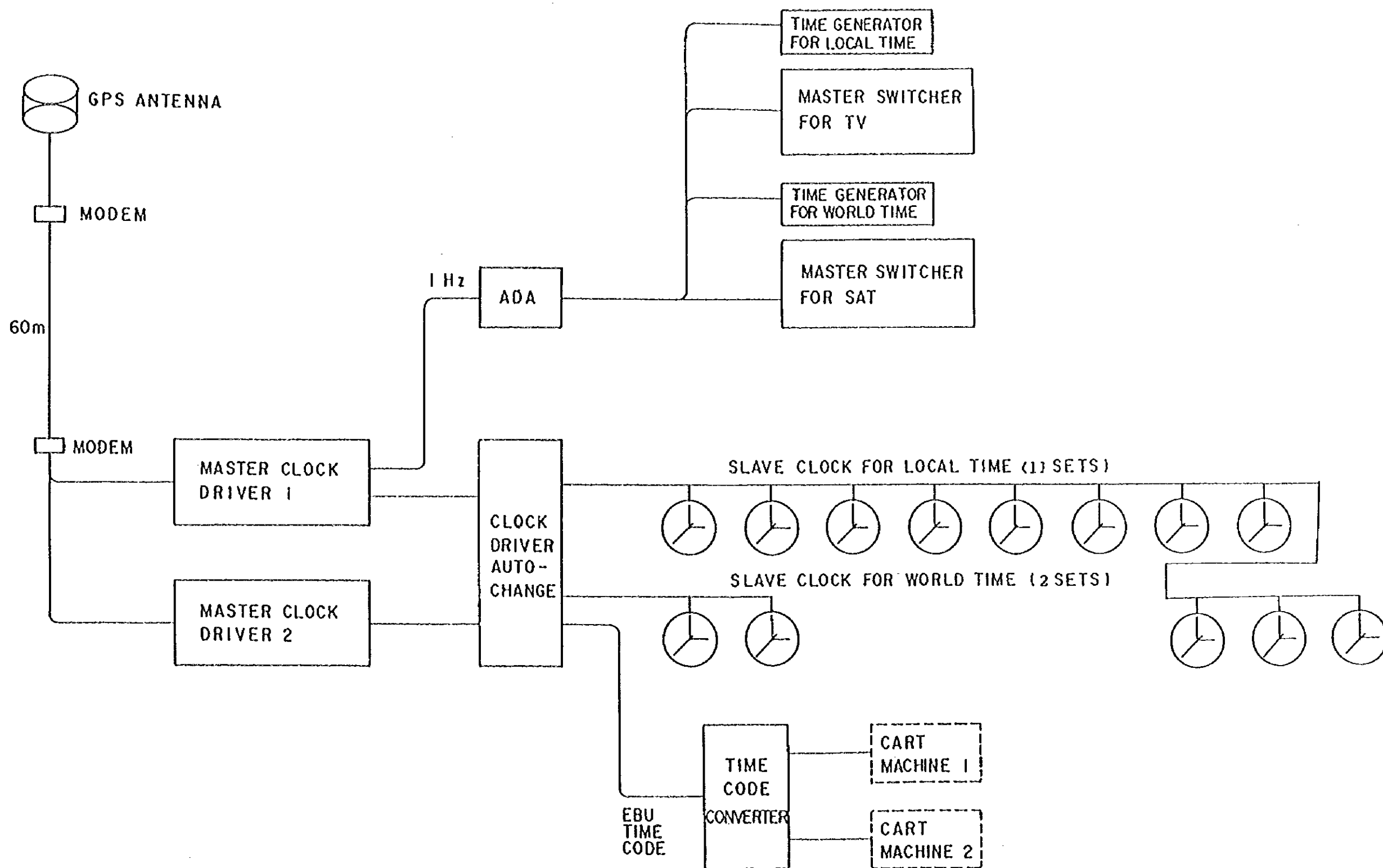
Figure 18   Master Clock System of Colombo Studio Center
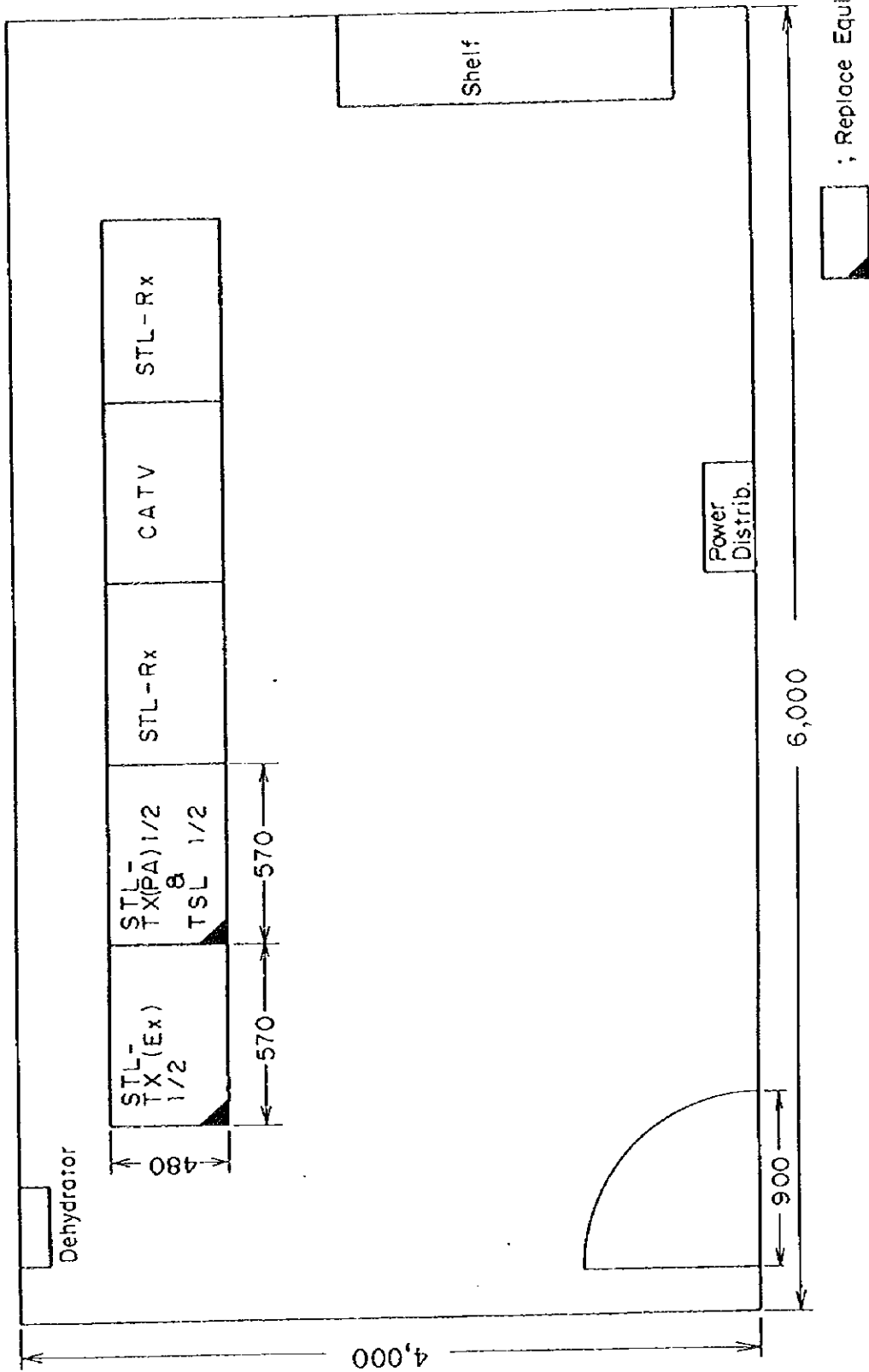
Figure 19 Floor layout of STL system in Colombo Studio Center
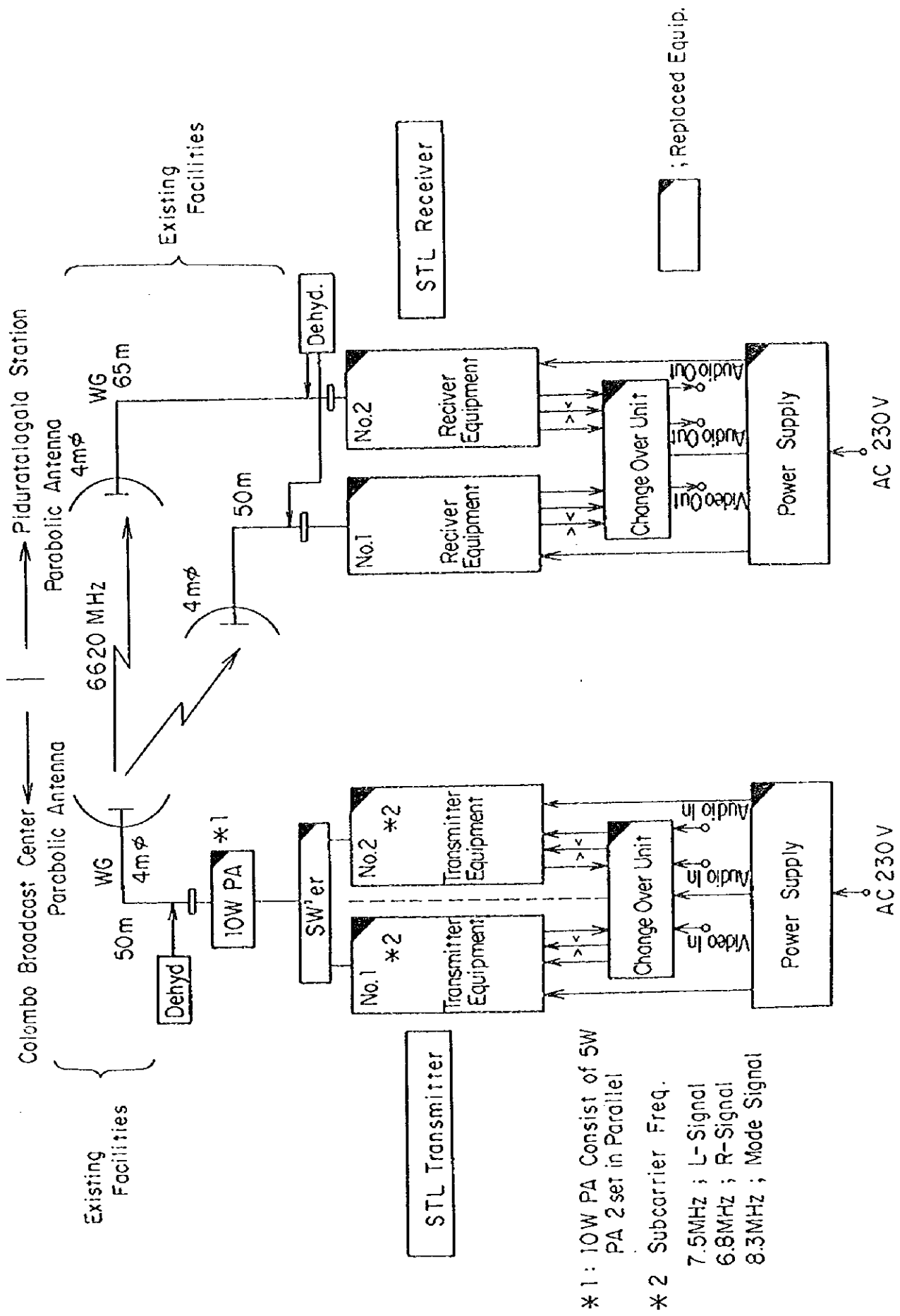
Figure 20　Block Diagram of STL system in Colombo Studio Center

*1: 10W PA Consist of 5W
　　PA 2 set in Parallel

*2　Subcarrier Freq.

　7.5MHz ; L-Signal
　6.8MHz ; R-Signal
　8.3MHz ; Mode Signal
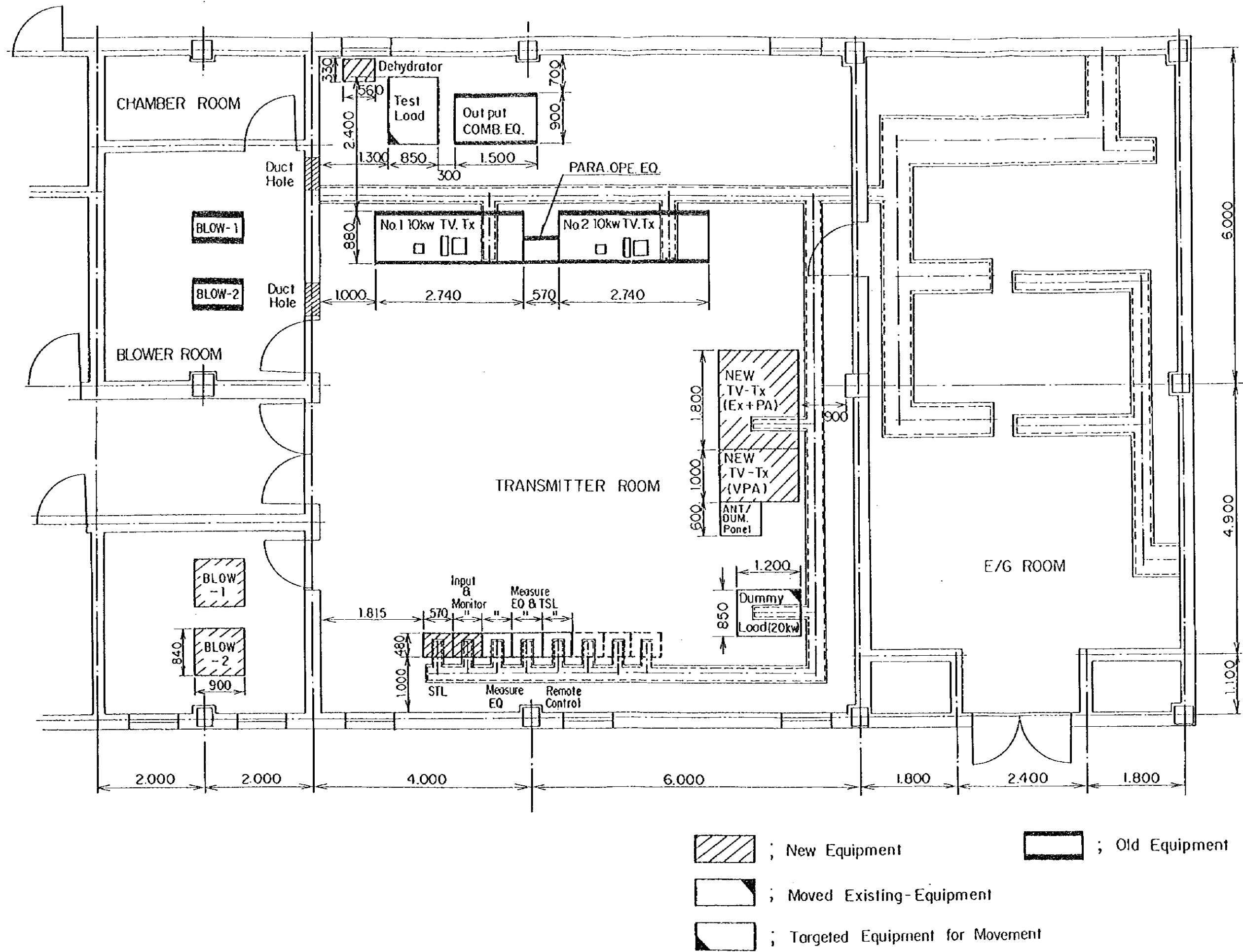
Figure 21　Floor layout of Pidurutalagala main transmitting station
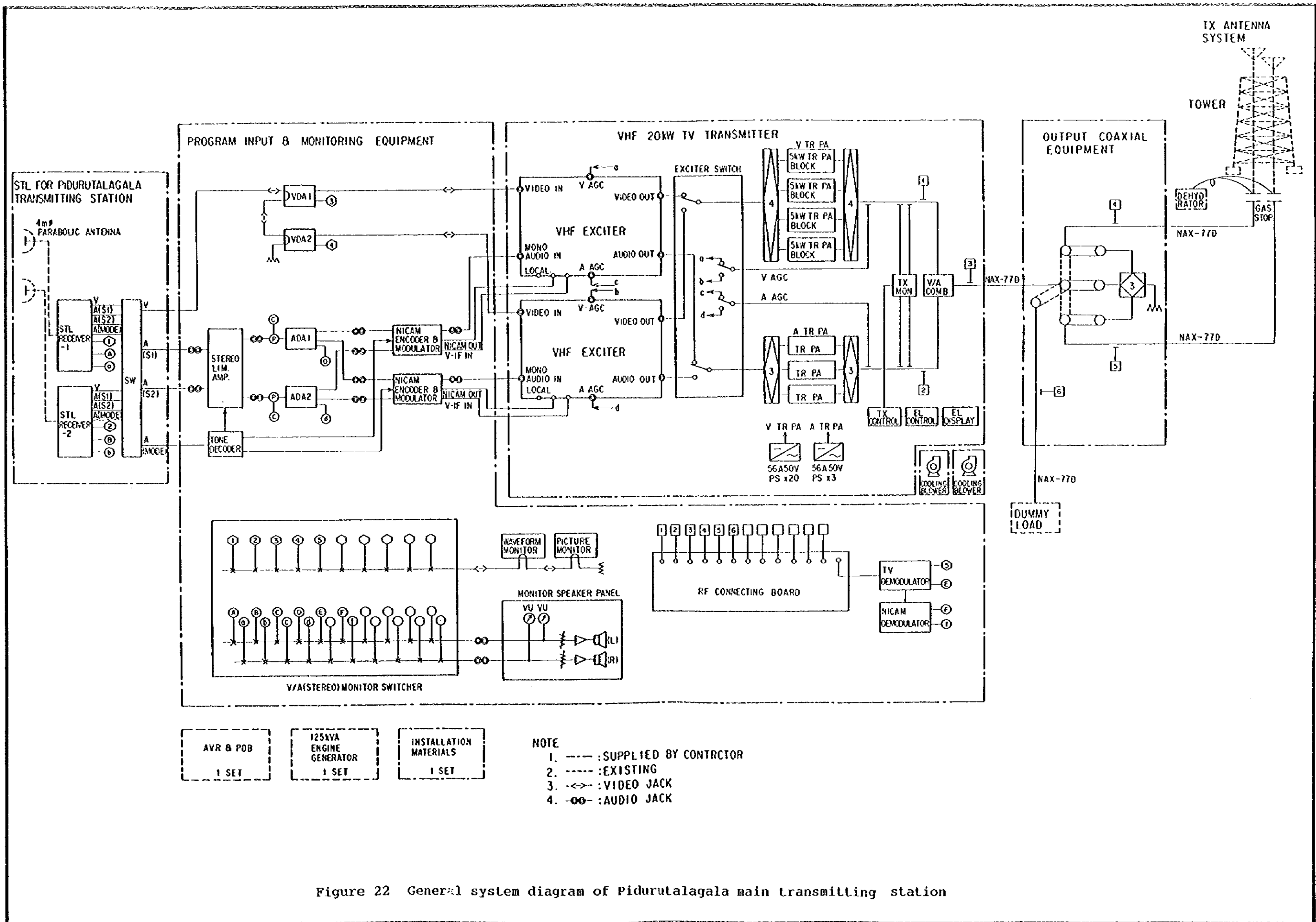
Figure 22   General system diagram of Pidurutalagala main transmitting station
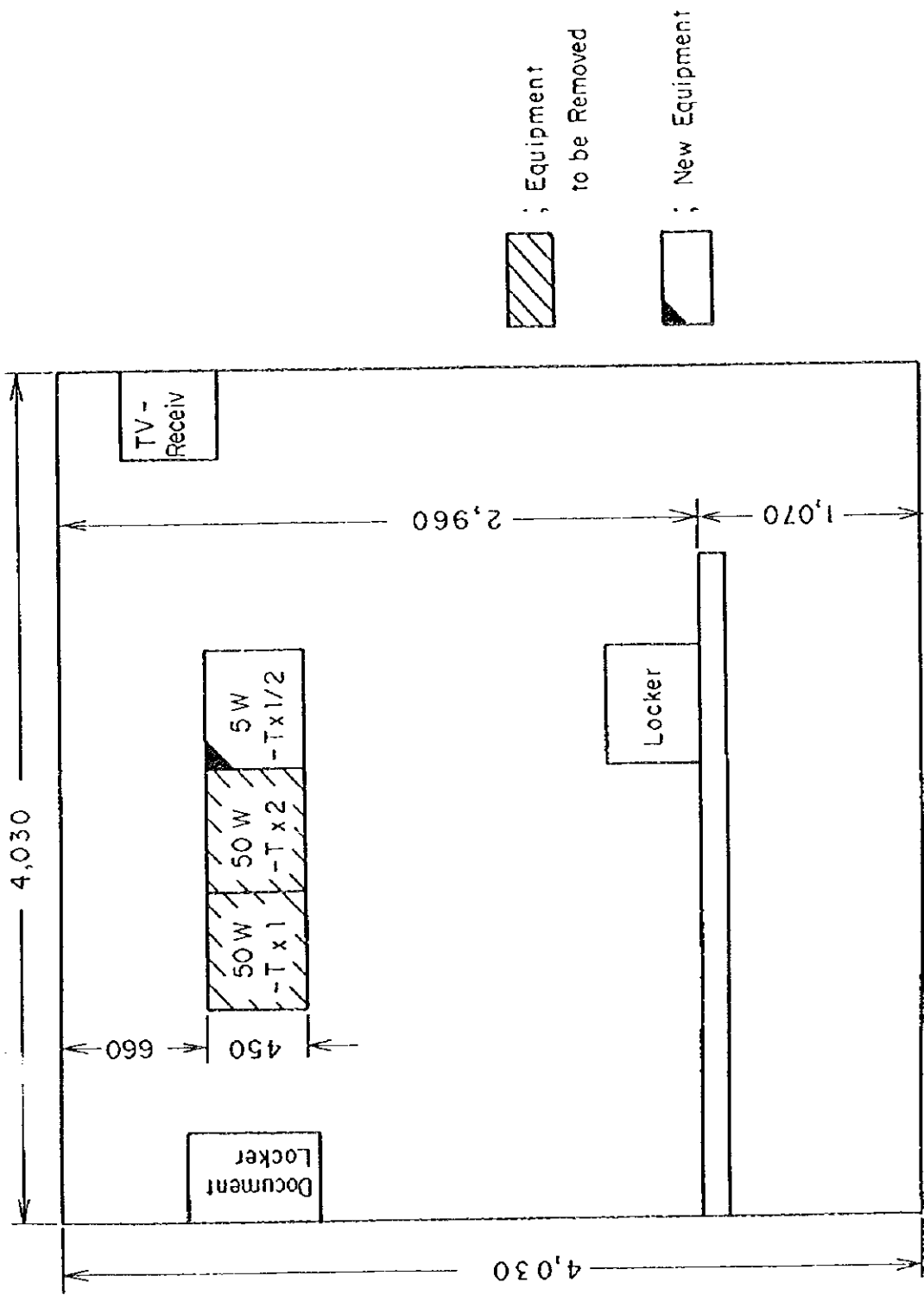
Figure 23   Floor layout of Primrose Hill transposer station

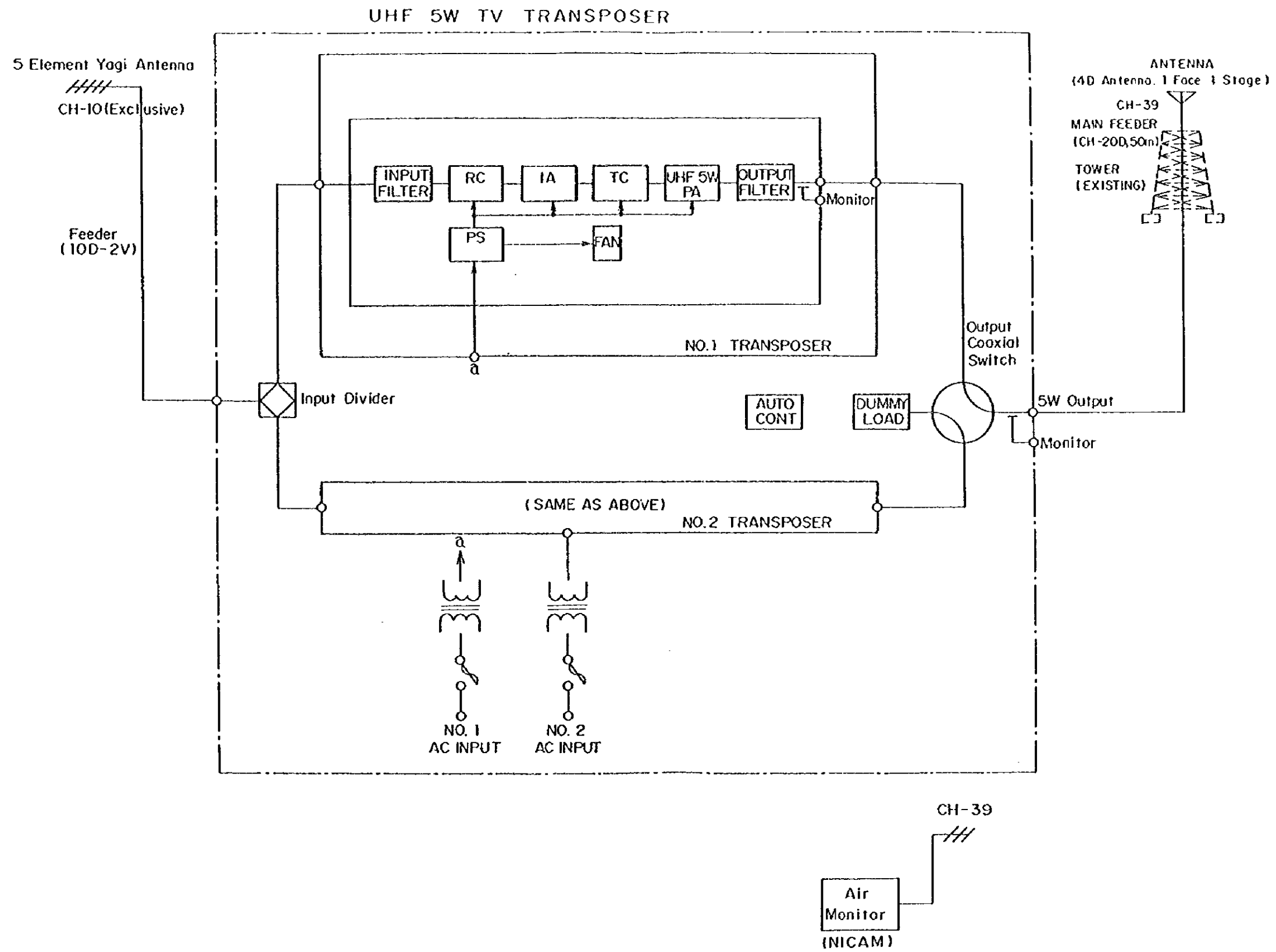UHF 5W TV TRANSPOSER

5 Element Yagi Antenna

CH-10(Exclusive)

Feeder
(10D-2V)

ANTENNA
(4D Antenna. 1 Face 1 Stage)

CH-39
MAIN FEEDER
(CH-20D,50m)

TOWER
(EXISTING)

INPUT FILTER — RC — IA — TC — UHF 5W PA — OUTPUT FILTER — T — Monitor

PS — FAN

NO.1 TRANSPOSER

Input Divider

AUTO CONT

DUMMY LOAD

Output Coaxial Switch

5W Output

Monitor

(SAME AS ABOVE)   NO.2 TRANSPOSER

NO. 1 AC INPUT

NO. 2 AC INPUT

CH-39

Air Monitor
(NICAM)

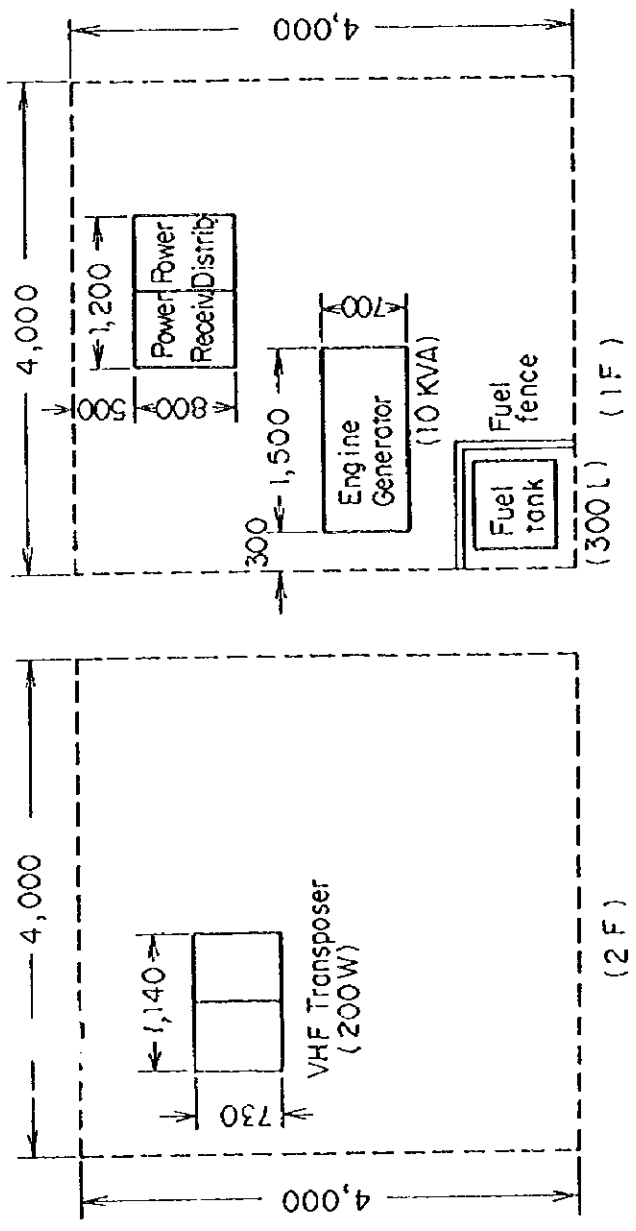Figure 24   General system diagram of Primrose Hill transposer station
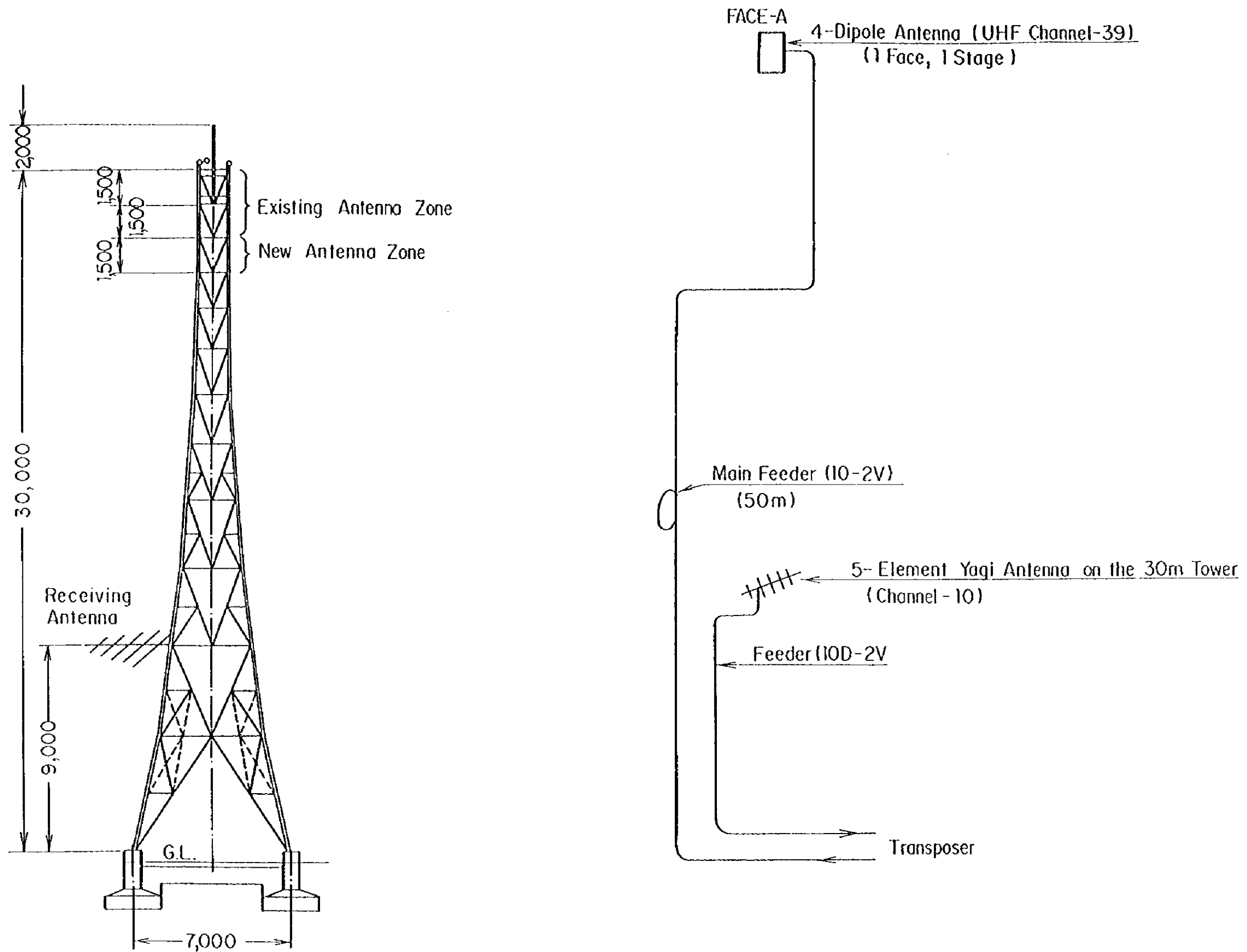
Figure 25   Antenna system diagram of Primrose Hill transposer station

Figure 26 Floor layout of Hantana transposer station

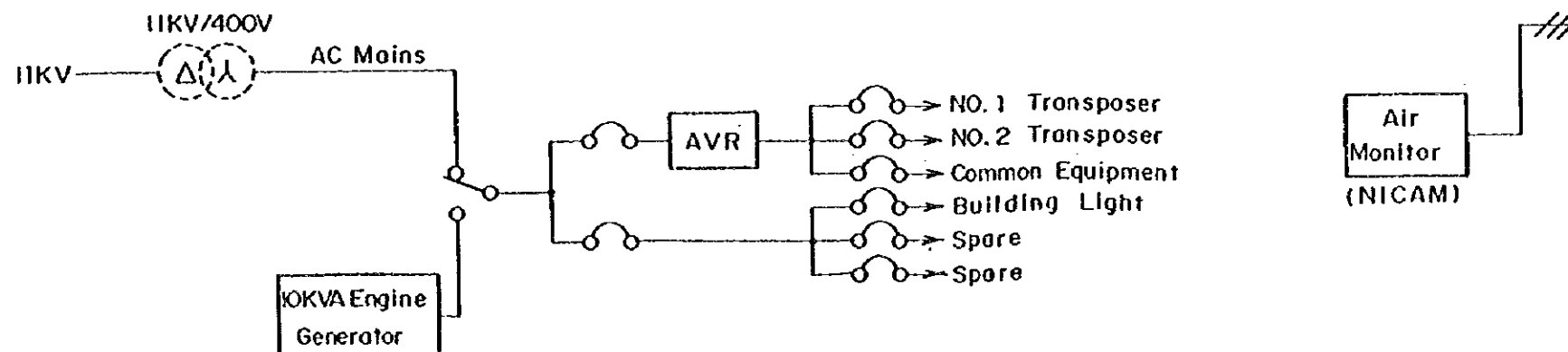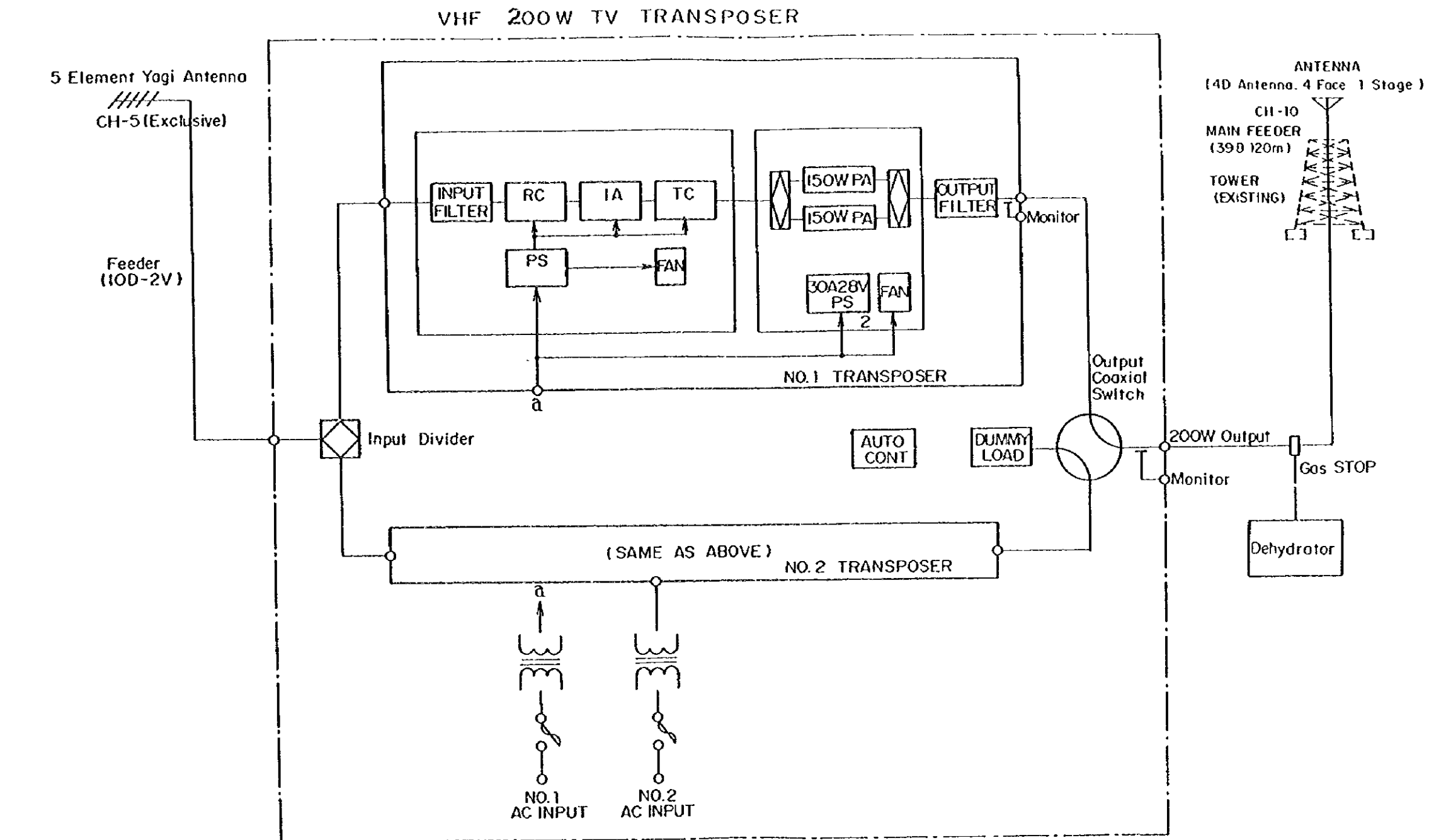Figure 27   General system diagram of Hantana transposer station

FACE-A FACE-B FACE-C FACE-D 4-Dipole Antenna (channel-10)
(4 faces, 1 stage)

Branch Cable

1,500

2,800

4D Antenna

Junction Box

Approximately 100,000

Main Feeder (39D)
(120m)

5-Element Yagi Antenna on the 10 m Pole
(Channel-5)

Feeder (10D-2V)

Transposer
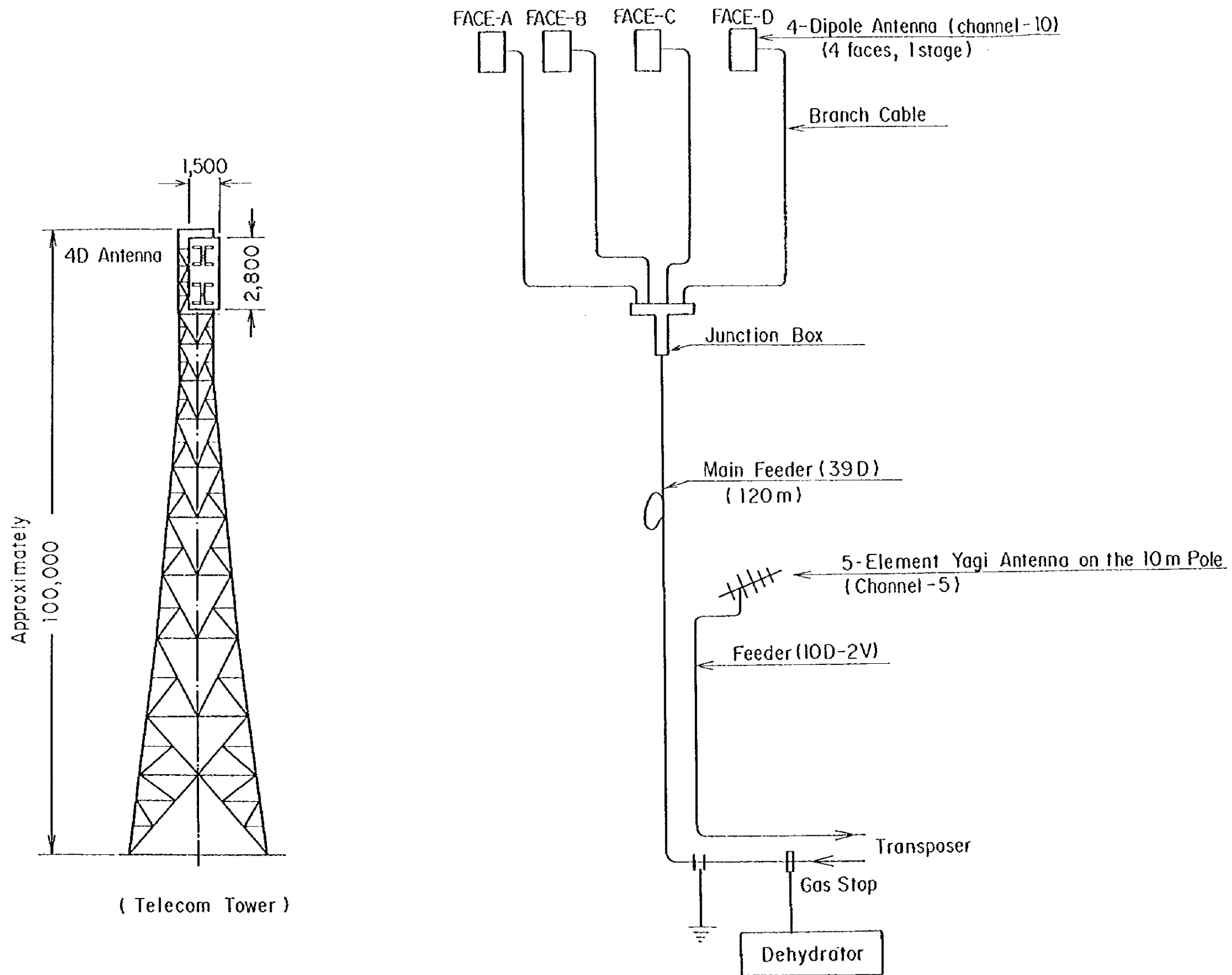
Gas Stop

(Telecom Tower)

Dehydrator

Figure 28   Antenna system diagram of Hantana transposer station