THE FEASIBILITY STUDY

ON

FLOOD CONTROL, FORECASTING AND WARNING SYSTEM

FOR

SEYHAN RIVER BASIN

Supporting Report F Feasibility Grade Design and Estimate of Project Cost

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1. INTRODUCTION

This Supporting Report F describes the feasibility grade design of flood forecasting and warning system based on the formulation of optimum plan described in the Supporting Report E. And also, implementation schedule and estimation of project cost are described.

The feasibility grade design of each facility composed of flood forecasting and warning system is made on the following items:

(1) Each station equipment composition
(2) Design particular of each radio communications facility
(3) Design particular of power supply facility of each station
(4) Design particular of gauging equipment of each gauging station
(5) Outline of specifications of major equipment

The chapter of implementation schedule and project cost estimate describes the construction period, project cost and annual maintenance expenses as follows:

(1) Construction period is twenty two (22) months.
(2) Estimate of project cost is US$11,970,140 in foreign currency side, and 22,579,464,000 TL in domestic currency side.
(3) Annual maintenance expenses is 4,091,850,000 TL

2. FEASIBILITY GRADE DESIGN

2.1 Feasibility Grade Facilities Design

2.1.1 Station equipment configurations

Each station equipment composition in the feasibility grade design should be shown in Figure 2.1.1 to Figure 2.1.18.

2.2 Feasibility Grade Design for Telemetering Facility

The feasibility grade design for the telemetering facility that is to collect hydrometeorological data should be described below.

2.2.1 Feasibility grade design for the specifications of telemetering radio communications equipment

Based on the results of radio wave propagation survey, the feasibility grade designed specifications of the telemetering radio communications facility of each station should be listed in Table 2.2.1 to Table 2.2.2

2.2.2 Outline of telemetering scheme

The following should give outline of the telemetering scheme to be used for the flood forecasting and warning system:

(a) Data collection scheme

- Data collection procedures : Polling
- Collection modes : Automatic and manual
  - Automatic : 4-level collection interval setting
  - Manual : General polling and individual polling
- Recall : Automatic recalling possible if code errors are detected

(b) Transmission scheme

- Method of communication : Half-duplex
- Method of modulation : Frequency modulation
- Transmission rate : 200 bps
- Method of error detection : 16-bit cyclic code or equivalent method

2.2.3 Outline of specifications of major equipment

The specifications of the major equipment of the telemetering facility should be outlined below.

(a) Telemetering supervisory equipment

- Collection station capacity	:	30 stations
- Data collection	:	Satisfies the requirements described in Section 2.2.2 (a) above
- Power supply	:	220 V AC

(b) Telemetering equipment

- Data transmission capacity	:	One/two sets of data
- Transmission protocol	:	Automatic response (Polling)
- Sensor interface	:	Digital parallel input (Such as water level gauge and temperature gauge) Pulse input (Rain gauge) Analog input (Air temperature gauge)
- Power supply	:	12 V DC

(c) Repeater equipment

- Method of repeater	:	Squelch
- Repeater control	:	Remote control of repeater start/stop
- Method of duplexing	:	Transmitter #1-#2 changeover Receiver parallel receiving
- Automatic changeover	:	Changeover based on failure detection
- Remote control	:	Repeater start/stop and transmitter changeover
- Remote monitoring	:	Operational status, failure, etc.

(d) Mimic display equipment

- Display	:	Mimic map display panel and digital display display panel
- Data display	:	Approx. 70 sets of data
- Power supply	:	220 V AC

(e) Communications control unit

- Control lines	:	4(maximum)
- Data transmission protocol	:	HDLC or BSC
- Data transmission rate	:	4800 bps

- Processing function : Primary processing of data
- LAN interface : IEEE802.3 or higher level
- Received-data storage : Approx. 7 days of storage of 100 sets of data as backup
  (Expressed on a one-hour-interval gauging basis)

(f) Printer unit
- Print characters : Approx. 96 ASCII codes
- Method of printing : 24-dot matrix or equivalent
- Character printing format : 137/167 characters per line
- Printing width : Approx. 15 inches

(g) Telephone informing and replying equipment
- Applicable line types : Subscriber telephone lines, private lines, etc.
- Line connection capacity : 4 (maximum)
- Maximum messaging capacity : 5 places per line
- Response time : 150 seconds (maximum)
- Input data capacity : 100 sets (maximum)

(h) Rainfall gauging equipment
- Method of gauging : Tilting-bucket type
- Water-receiving port diameter : 200 mm
- Minimum unit of gauging : 1 mm per tilt
- Telemetering signal output : 1 pulse per tilt
- Gauging error rate : 3 mm or less for an hourly rainfall of 100 mm
- Recording : Long-term pen-writing recorder
- Recording term : 3 months

(i) Float-type water level gauging equipment
- Gauging range : 0 to 10 m
- Gauging accuracy : Within ± 1 cm
- Telemetering signal output : Digital parallel output (BCD with parity bit)
- Recording : Dual-pen
- Recording term : 3 months
- Float diameter : Approx. 300 mm

(j) Pressure-type water level gauging equipment

- Detection element : Crystal-type pressure sensor
- Gauging accuracy : 0.05% or less at full scale
- Telemetering signal output : Digital parallel output (with BCD parity)
- Recording : Dual-pen
- Recording term : 3 months

(k) Air temperature gauging equipment

- Method of detection : Platinum resistance bulb
- Gauging range : -50 to +50°C
- Gauging accuracy : ±0.15°C
- Resistance bulb : Pt, 100-ohm, 4-wire
- Telemetering signal output : Digital output (BCD with parity bit)

(l) Radio communications equipment

- Transmitter
  - Output : 1/3/10 W
  - Frequency : 70 MHz
  - Method of modulation : Phase modulation
  - Frequency bandwidth occupied : Within 16 kHz
  - Maximum frequency fluctuations : ±5 kHz
- Receiver
  - Bandwidth : 12 kHz or more at a point noise-reduced by 6 dB
  - Selectivity : 25 kHz or more at a point noise-reduced by 70 dB
  - Receiving sensitivity : Approx. 3 dBμV or less (on a 20 dB NQ basis)

(m) Antenna equipment

- Manufacturer : Yagi Antenna
- Elements : 3/5 elements
- Gain
  - 3-element : 6 dB or more
  - 5-element : 9 dB or more

(n) Coaxial lightning arrester

- Insertion loss : 0.5 dB or less

- Standing wave ratio : 1.2 or less at the designated frequency
- Withstand voltage : 3 kVA or less

2.3 Feasibility Grade Design for Multiplex Radio Communications Facility

The feasibility grade design concepts for the multiplex radio communications facility of the flood forecasting and warning system should be described below.

2.3.1 Frequency assignment planning

Considering the three-way route branching circuits and D/U ratio that are characteristic of the multiplex radio communications links configuration, a minimum of three pairs of radio frequency assignment should be required for the multiplex radio communications links. Of all frequencies falling within the range from 2,520 to 2,670 MHz that is shown in the recommendations of the Conference of European Postal and Telecommunications Administration (CEPT), only those which are temporarily licensed by the TGM should be assigned to suit the particular domestic situation of the Republic of Turkey. One example of assigning frequencies is shown in Figure 2.3.1.

2.3.2 Channel plan

The items listed below are considered during study of a channel plan for the multiplex radio communications facility. The results of feasibility grade design for the channel plan should be shown in Figure 2.3.2

(a) The links required for the data collection system should be reserved. For maintenance purposes, start connection is excellent as the method of using channels. The multi-drop scheme, however, should be used as far as possible, since this method allows the multiplex radio communications links channels to be used very effectively.

(b) To ensure that a direct telephone system is structured, private lines should be provided for the control center and the following related places:

- Between the flood control committee of the DSİ 6 th regional directorate and the Seyhan Dam office
- Between the flood control committee of the DSİ 6 th regional directorate and the Çatalan Dam office

(c) Considering the operating conditions of the flood forecasting and warning system and the frequency of use of necessary telephone sets, a telephone exchange should be installed in the control center.

(d) Two (2) multiplex-type liaison telephone channel should be assigned to each place and accommodated in the intercommunications system of the telephone exchange.

(e) Two (2) liaison radio telephone channels should be assigned to the section between the telephone exchange to be installed in the control center, and the UHF radio communications base station.

(f) Two (2) channels should be reserved for data distribution between the control center and the Seyhan and Çatalan Dam offices. One of these two channels should for spare use in the future.

2.3.3 Feasibility grade design for specifications of the multiplex radio communications equipment

Based on the results of survey of radio wave propagation, the feasibility grade designed specifications of the multiplex radio communications facility of each station should be listed in Table 2.3.1. The basis for the circuit design should comply with Recommendation 594 and Report 930 of the CCIR (Consultative Committee on International Radio), and the basis for calculation of the fading probability should comply with CCIR Report 338-5.

2.3.4 Outline of specifications of major equipment

The specifications of the major equipment of the multiplex radio communications equipment should be outlined below.

(a) Multiplex radio equipment

- Frequency band : 2 GHz band
- Transmission capacity : 2.048 Mbps (30 CH)
- Method of modulation : 4-phase differential phase modulation (4PSK) or equivalent method
- Transmission output : 1 W

(b) PCM multiplex terminal equipment

- Method of transmission : Pulse code modulation or equivalent method
- Method of multiplexing : Time-division multiplexing
- Channel capacity : 30 CH
- Bit rate : 2.048 Mbit + 50 ppm - 50 ppm

(c) Integrated Terminal Equipment

- Speech path : Time division (PCM)
- Switching network : T1 stage, 512 time slots, Fixed assignment of time slots
- Highway format : 8 bits x 32 time slots, 2.048 Mbps
- PCM line : 2 PCM lines
- Mutual connection system for transmission line : Digital to digital
  Digital to analog

(d) Antenna equipment

- Frequency band : 2 GHz band
- Model : Grid-parabolic
- Aperture : 0.9m to 3.8 m
- Gain : Approx. 23 dB to 35 dB

(e) Antenna cable

- Outside diameter : Approx. 30 mm or 50 mm
- Attenuation : Approx. 6.6 dB/100 m or 4.6 dB/100 m

2.4 Feasibility Grade Design for Data Processing Facility

The data processing system should use distributed processing configuration.

2.4.1 Outline of specifications of major equipment

The specifications of its major components should be outlined below.

(a) File server equipment

- File server unit
  - CPU : 64 bits processor
  - Clock : 100 MHz or more
  - Main memory : 64 MB or more

- Hard disk drive : 4 GB or more

- LAN interface
  - Interface : IEEE 802.3
  - Speed : 10 Mbps
- CD-ROM drive
  - Disk capacity : 600 MB or more
- Magnetic tape unit
  - Storage capacity : 4 GB or more

(b) EWS equipment (For forecast processing)

- EWS main unit
  - CPU : 64 bits processor
  - Clock : 100 MHz or more
  - Main memory : 128 MB or more
  - Cash memory : 512 KB or more
  - LAN interface : IEEE 802.3
  - LAN speed : 10 Mbps or more
  - Hard disk drive : 2 GB or more
  - 3.5-inch floppy disk drive : 2.8 MB or more
- CRT unit
  - Screen size : 19-inch color or more
  - Resolution : 1.280X1024 dots
  - Display color : 256-color or more
- Operating system : UNIX, TCP/IP, X-Windows, etc.

(c) EWS equipment (For data display processing)

- EWS main unit
  - CPU : 64 bits processor
  - Clock : 100 MHz or more
  - Main memory : 32MB or more
  - Cash memory : 512 KB or more
  - LAN interface : IEEE 802.3
  - LAN speed : 10 Mbps or more
  - Hard disk drive : 1 GB or more
  - 3.5-inch floppy disk drive : 2.8 MB or more
  - LAN interface : IEEE 802.3
- CRT unit
  - Screen size : 19-inch color or more
  - Resolution : 1.280X1024 dots

- Display color : 256-color or more
- Operating system : UNIX, TCP/IP, X-Windows, etc.

(d) Data display terminal
- CPU : 64 bits processor
- Memory : 32 MB or more
- CRT unit
  - Screen size : 19-inch color or more
  - Resolution : 1.280X1024 dots
  - Display color : 256-color or more

(e) Laser printer
- Model : Page printer
- Printing speed : 8 sheets/min.(A4 size)

(f) Hard copy unit
- Method of recording : Thermal type printer
- Printing time : Approx.. 60 seconds/screen
- Output size : A4 size

2.5 Feasibility Grade Design for Liaison Radio Communications Facility

The feasibility grade design data for the liaison radio communications equipment of the flood forecasting and warning system should be shown below.

2.5.1 Feasibility grade design for specifications of the liaison radio communications facility

Based on the results of survey of radio wave propagation, the feasibility grade designed specifications of the liaison radio communications facility of each station should be listed in Table 2.5.1.

2.5.2 Outline of specifications of major equipment

The specifications of the major equipment of the liaison radio communications equipment should be outlined below.

(a) Terminal station radio communications equipment
- Frequency band : 335.0 to 470.0 MHz
- Channel interval : 12.5 kHz/25.0 kHz

- Send/receive frequency interval : 112.8 MHz
- Method of modulation : Phase modulation
- Method of communication : Full-duplex
- Transmission output : 10 W/25 W
- Power supply : 12 V DC

(b) Radio communications equipment for voice contact

- Frequency band : 335.0 to 470.0 MHz
- Channel interval : 12.5 kHz/25.0 kHz
- Send/receive frequency interval : 2 MHz or more
- Method of modulation : Phase modulation
- Method of channel access : Multi-access
- Method of communication : Half-duplex
- Transmission output : 10 W
- Power supply : 12 V DC

2.6 Feasibility Grade Design for Power Supply Facility

The basis for the feasibility grade design of the power supply facility each station should be described below. As a result of feasibility grade design, Table 2.6.1 to Table 2.6.3 should list the design particular of power supply facility.

(1) Control center

Since the power supply facility of the control center forms the core of the flood forecasting and warning system, the facility should be completely uninterruptible. The uninterruptible power supply facility should consist of AC uninterruptible power supply equipment and a standby engine generator, since the control center has a large load capacity.

(2) Dam offices

The power supply facility of the Seyhan Dam and Çatalan Dam offices should be completely uninterruptible to ensure continual display of dam management processing data and execution of dam operating commands through direct telephone calls. The uninterruptible power supply facility should consist of AC uninterruptible power supply equipment, DC power supply equipment, and a standby engine generator.

(3) Data monitoring stations

Since, in the data monitoring stations of the DSİ general directorate, the EİE, or the DMİ, data will not be processed and will only be received, displayed, recorded, etc., the power supply facility of these stations should consist of that uninterruptible type based on AC uninterruptible power supply equipment that permits about 10 minutes of interruption.

(4) Multiplex radio communications stations

Since the power supply facility of the multiplex radio communications stations forms one functionally integral part of the flood forecasting and warning system, the facility should consist of the completely uninterruptible type that consists of DC power supply equipment and a standby engine generator.

(5) Telemetering repeater stations and gauging stations

Considering the power supply situation in the Seyhan River basin areas, the power supply facility of the telemetering repeater stations and gauging stations should consist of the solar battery type as far as possible, even if commercial power can be received.

(6) UHF radio liaison stations

Considering the power consumption and frequency of operation use, the power supply facility of the UHF radio liaison stations should consist of DC power supply equipment.

2.7 Selection of Gauging Equipment for Each Station, and Study of Gauging Equipment Specifications

The results of feasibility grade design of the gauging equipment for each station should be shown in Table 2.7.1. It is necessary, however, that only after conducting more close surveys on the site conditions and finally designing the gauging equipment, the types, specifications, etc. of gauging equipment should be finally set during a further detailed design phase.

3. IMPLEMENTATION PLAN AND COST ESTIMATION

3.1 Implementation Schedule

The implementation schedule for the structuring of the flood forecasting and warning system is shown in Table 3.1.1. During formulation of the implementation schedule, the following items are incorporated into the schedule:

(1) Entire work period

The entire work, which ranges from detailed designing to civil construction work, equipment procurement, transportation, installation, adjustment, acceptance test and site OJT (On -the-Job Training) will be completed within twenty two (22) months; this period considering the scale of the system and the number of places which require work.

(2) Detailed design period

The period of detailed design based on the results of feasibility study, including preparation of Tender Documentation, will be set to become five (5) months.

(3) Supplemental radio wave propagation investigation

The period of supplemental radio wave propagation investigation occurring after completion of detailed designing will be set to become about two (2) months. This period will include the period of the radio wave propagation investigation of the Seyhan River upstream basin and other areas that was not executable because of the limited time and for other reasons during the feasibility study.

(4) Tender processing period

The period required for Tender processing will be set to become two (2) months.

(5) Civil construction work period

The civil construction work for towers, station buildings and all other related facilities should be executed by the Government of the Republic of Turkey. The implementation schedule will be formed for the preparation work and necessary work period to become seven point five (7.5) months.

(6) Equipment design and manufacture period

The period of equipment design and manufacture (factory witness inspection included) will be set to become seven (7) months; this period considering the situation of equipment procurement in Japan.

(7) Transportation period

The total period required for export processing from Japan, marine transportation (including the customs clearance in İşikenderum, the Republic of Turkey), and inland transportation in the Republic of Turkey, will be set to become two (2) months.

(8) Equipment installation and adjustment period

Considering the number of about fifty (50) related sites and the geographical conditions of these sites, the equipment installation and site adjustment period will be set to become six (6) months, including the preparation work period.

(9) Final acceptance test period

The final acceptance test period will be set to become one (1) month.

(10) Training period

The maintenance personnel for the flood forecasting and warning system requires prior overseas training and site OJT, and the overseas training period and the site OJT period will be set to become one (1) month and one point five (1.5) months, respectively,

3.2 Construction Cost Estimation

3.2.1 Basic conditions for construction cost estimation

Direct construction work costs are estimated on the basis of the work quantities and work unit costs during the feasibility study. The major assumptions and conditions for construction cost estimation are listed below.

(a) All prices will be the market prices existing as of February 1994. Commercial power leading-in work expenses and inland transport expenses, however, are

estimated by multiplying the market prices existing as of February, 1993, by 1.6.

(b) Construction costs are estimated in both foreign currency (the US. dollar) and domestic currency (the Turkish lira). The exchange rate as of February 1, 1994, is used as that of the dollar and the yen. This exchange rate is shown below.
$1 = ¥109.20

(c) Construction costs consist of the following items:

- Direct construction expenses
- Governmental overhead expenses
- Engineering expenses
- Educational and training expenses
- Provisional expenses

(d) Land compensation expenses are estimated in domestic currency and included in Construction costs.

3.2.2 Construction cost estimation

Construction costs are estimated for each of the items listed below.

(1) Direct construction cost

The direct construction expenses estimated here consist of direct expenses (such as labor expenses, materials expenses, equipment expenses, etc.) and indirect expenses (such as the indirect expenses, profits, and site expenses of subcontractors). Of all these direct expenses, only the expenses for the work listed below are estimated in Turkish domestic currency that includes a value added tax of 15%. Any equipment and materials that may be imported are handled tax-free in their cost estimates.

- Construction work for towers (Design and materials included)
- Construction work for station buildings and water level gauging wells (Design and materials included)
- Construction work for pressure type water level gauge protective piping facilities (Design and materials included)
- Construction work for water level gauge extension cable ducting
- Construction work for maintenance roads (One part excluded)

- Construction work for commercial power leading-in
- Installation and adjustment work (Experts expenses excluded)
- Initial installation work for termination PTT private lines
- Inland transportation in the Republic of Turkey (Unloading and storage warehouse expenses included)

(2) Governmental overhead expenses

The expenses for administration, operation, and other management jobs by the Turkish Government are estimated at the rate of 1 % of the total direct work expense.

(3) Engineering expenses

Engineering expenses for the detailed design and implementation/management jobs that will be carried out by Engineers are estimated at the rate of 13% of the equipment expense.

(4) Educational and training expenses

The educational and training expenses for the overseas training and on-the-job training of Turkish engineers are estimated at the rate of 1.7 % of the equipment expense.

(5) Provisional expenses

The provisional expenses are estimated at the rates of 15% of the total civil construction work expense and 5 % of the total equipment and installation/adjustment expense.

The construction costs based on the above estimates are listed in Table 3.2.1, and an outline of the construction costs is given below. Station-by-station direct work expenses are listed in Table 3.2.2.

Item	Foreign currency (Unit: $)	Domestic currency (Unit: 1000 TL)
Direct construction expense	10,096,490	19,745,400
Land acquisition expense	0	6,600
Governmental overhead expense	0	197,454
Engineering expense	1,170,200	0
Educational/training expense	148,580	0
Provisional expenses	554,870	2,630,010
Total construction expenses	11,970,140	22,579,464

3.3 Maintenance and Management Cost

To ensure continued normal operation of the flood forecasting and warning system after completion of this project, appropriate maintenance and management is required. Maintenance expenses for the flood forecasting and warning system should therefore be budged. Annual maintenance and management expenses are estimated below.

3.3.1 Estimation conditions

Annual maintenance and management expenses are estimated under the conditions listed below.

(1) Maintenance and management system

The maintenance and management system, which is described in Supporting Report E. Chapter 8 Maintenance and Management System, is to be established.

(2) Operation of a standby engine generator

A standby engine generator shall be operated for 40.00 hours/month. Its fuel expenses are estimated.

(3) Repair and consumable parts cost

The repair and consumable parts cost per annum is estimated at the rate of 0.1% of an initial equipment cost.

(4) Vehicle cost

The necessary number of vehicles should be purchased to compensate for any insufficiency in quantity, and they will be renewed for every fifteen (15) years. The gas fee of vehicle is estimated on the assumption that one vehicle is to be driven through the distance of 12,000 km a year.

(5) Charges for the PTT private lines

The lease charges for the PTT private lines are estimated. The initial costs for the first fiscal year will be included in the construction cost estimates.

(6) Electricity charges

The electricity charges per annum are estimated.

(7) Management expenses

Management expenses are estimated at the rate of 15% of the annual maintenance expenses.

3.3.2 Maintenance expenses

The maintenance expenses per annum are listed in the table below.

Item	Foreign currency (Unit: $)	Domestic currency (Unit: 1000 TL)
1. Personnel expense	—	1,968,000
2. Fuel expense	—	137,120
3. Repair part expense	—	208,460
4. Vehicle gas expense	—	19,550
5. PTT private line charge	—	755,000
6. Electricity charge	—	470,000
7. Management expense	—	533,720
Total		4,091,850

Tables

Table 2.2.1 Design Particular of Telemetering Radio Communications Facility (1/2)

No.	Station	Type	Radio Equipment		Antenna			Tower Height (m)	Feeder		Station Building	Remarks
			Frequency Band (MHz)	Power (W)	Type	Q'ty	Height (m)		Type	Length (m)		
1	Çamardı	R	70MHz	10	5EL Yagi / B	1	10	15	AFZE50-4	15	To be built	
2	Çiftehan	R	70MHz	1	3EL Yagi / B	1	10	15	10D-2E	15	To be built	
3	Kamişlı	R & T	70MHz	10	3EL Yagi / B	1	15	20	10D-2E	20	To be built	
4	Pozantı	R & T	70MHz	3	3EL Yagi / B	1	15	20	10D-2E	20	To be built	
5	Karaisalı	R	70MHz	1	3EL Yagi / B	1	10	15	10D-2E	15	To be built	
6	Karsantı (Hasandede)	R & T	70MHz	10	5EL Yagi	1	15	20	10D-2E	20	To be built	
7	1825	WL	70MHz	10	3EL Yagi / B	1	15	20	10D-2E	20	To be built	
8	1820	WL	70MHz	1	3EL Yagi / B	1	10	15	10D-2E	15	To be built	
9	1818 (Eğner)	WL	70MHz	1	3EL Yagi	1	10	15	10D-2E	15	To be built	
10	1828	WL	70MHz	10	3EL Yagi / B	1	18	20	10D-2E	25	To be built	
11	Kazancık	R	70MHz	10	3EL Yagi	1	10	15	10D-2E	15	To be built	
12	Pinarbaşı	R	70MHz	1	3EL Yagi	1	10	15	10D-2E	15	To be built	
13	Toklar	R	70MHz	10	3EL Yagi	1	10	15	10D-2E	15	To be built	
14	Tomarza	R & T	70MHz	10	3EL Yagi / B	1	10	15	10D-2E	15	To be built	
15	Seyhlı	R & T	70MHz	10	3EL Yagi	1	10	15	10D-2E	15	To be built	
16	1822	WL	70MHz	10	3EL Yagi / B	1	18	20	10D-2E	25	To be built	
17	1806	WL	70MHz	10	3EL Yagi	1	10	15	10D-2E	15	To be built	
18	Tufanbeyli	R & T	70MHz	10	3EL Yagi / B	1	15	20	10D-2E	20	To be built	
19	Saimbeyli	R	70MHz	10	3EL Yagi / B	1	10	15	10D-2E	15	To be built	
20	Feke	R	70MHz	10	5EL Yagi / B	1	18	20	10D-2E	25	To be built	
21	Mansurlu	R & T	70MHz	1	3EL Yagi / B	1	10	15	10D-2E	15	To be built	
22	1801	WL	70MHz	3	3EL Yagi / B	1	18	20	10D-2E	25	To be built	
23	1805	WL	70MHz	10	3EL Yagi	1	10	15	10D-2E	15	To be built	

Notes: (R): Rainfall gauging station, (R & T): Rainfall and air tempereture gauging station, (WL): Water level gauging station

Yagi / B: Broad band Yagi antenna

Table 2.2.2 Design Particular of Telemetering Radio Communications Facility (2/2)

No.	Station	Type	Radio Equipment		Antenna			Tower Height (m)	Feeder		Station Building	Remarks
			Frequency Band (MHz)	Power (W)	Type	Q'ty	Height (m)		Type	Length (m)		
24	Bileğe T.	V-V RP.	70MHz	10 x 2	2EL Yagi	2	10	15 x 2	AFZE50-4 AFZE50-4	20(T) 20(R)	To be built	
25	Sallangac T.	V-V RP.	70MHz	10 x 2	2EL Yagi	2	10	15 x 2	10D-2E 10D-2E	20(T) 20(R)	To be built	
26	Sırvan Dağı	V-V RP. V-V RP.	70MHz 70MHz	10 x 2 10 x 2	Sleeve 3EL Yagi / B	1 1	10 10	15 x 2	10D-2E 10D-2E	20(T,R) 20(T,R)	To be built	Cross type
27	Alaylı(Ziyaret T.)	V-V RP.	70MHz	10 x 2	2EL Yagi	2	20	20 x 2	10D-2E 10D-2E	30(T) 30(R)	To be built To be built	
28	Kuzörent T.	V-V RP. V-V RP.	70MHz 70MHz	10 x 2 10 x 2	3EL Yagi 3EL Yagi / B	1 1	10 10	15 x 2	10D-2E 10D-2E	20(T,R) 20(T,R)	To be built	Cross type
29	Kılkoyak T.	V-V RP.	70MHz	10 x 2	Sleeve	2	10	15 x 2	10D-2E 10D-2E	20(T) 20(R)	To be built	
30	Süt T.	μ-V RP.	70MHz	10 x 2	Sleeve	1	10	30	10D-2E	20(T,R)	To be built	Building & tower are shared with multiplex radio system.
31	Feke Dağı	μ-V RP.	70MHz	10 x 2	Sleeve	1	10	30	10D-2E	20(T,R)	To be built	Building & tower are shared with multiplex radio system.
32	Karataş T.	V-V RP.	70MHz	10 x 2	Sleeve	2	10	15 x 2	10D-2E 10D-2E	20(T) 20(R)	To be built	
33	Karlık T.	μ-V RP.	70MHz	10 x 2	Sleeve	1	10	30	10D-2E	20(T,R)	To be built	Building & tower are shared with multiplex radio system.
34	Çatalan Dam	μ-V RP.	70MHz	10 x 2	3EL Yagi / B	1	10	30	10D-2E	20(T,R)	Existing	

Notes: (V-V RP.): VHF to VHF repeater station, (μ-V RP.): Multiplex radio to VHF radio repeater station
Yagi / B: Broad band Yagi antenna

Table 2.3.1 Design Particular of Multiplex Radio Communications Facility

No.	Station	Type	Radio Equipment		Antenna			Tower Height (m)	Feeder		Station Building	Remarks
			Frequency Band (MHz)	Power (W)	Type	Q'ty	Height (m)		Type	Length (m)		
1	DSİ Adana (FFW Center)	FFW	2GHz	1	GPA 0.9m	1	40	45	WF-H50-7	65	Existing	for Ziyaret T.
2	Ziyaret T.	Repeater	2GHz	1	GPA 0.9m	1	20	30	WF-H50-7	45	To be built	for Adana
			2GHz	1	GPA 1.2m	1	20		WF-H50-7	45		for Çatalan dam
			2GHz	1	GPA 0.9m	1	20		WF-H50-7	45		for Seyhan dam
3	Seyhan Dam	Dam office	2GHz	1	GPA 0.9m	1	20	25	WF-H50-7	45	Existing	for Ziyaret T.
4	Çatalan Dam	Dam office	2GHz	1	GPA 0.9m	1	25	30	WF-H50-7	50	Existing	for Ziyaret T.
			2GHz	1	GPA 3.0m	1	25		WF-H50-7	55		for Karlık
5	Karlık T.	Repeater	2GHz	1	GPA 3.0m	1	20	30	WF-H50-7	45	To be built	for Çatalan Dam
			2GHz	1	GPA 1.8m	1	20		WF-H50-7	45		for Nemec T.
6	Nemec T.	Repeater	2GHz	1	GPA 1.8m	1	20	25	WF-H50-7	50	To be built	for Karlık T.
			2GHz	1	GPA 2.4m	1	20		WF-H50-7	45		for Feke Dağı
7	Feke Dağı	Repeater	2GHz	1	GPA 1.8m	1	20	30	WF-H50-7	45	To be built	for Nemec T.
			2GHz	1	GPA 0.9m	1	20		WF-H50-7	45		for Meydancık
8	Meydancık	Repeater	2GHz	1	GPA 0.9m	1	20	30	WF-H50-7	45	To be built	for Feke Dağı
			2GHz	1	GPA 1.2m	1	20		WF-H50-7	45		for Süt T.
9	Süt T.	Repeater	2GHz	1	GPA 1.2m	1	20	30	WF-H50-7	45	To be built	for Meydancık

Table 2.5.1 Design Particular of Liaison Radio Communications Facility

No.	Station	Type	Radio Equipment		Antenna			Tower Height (m)	Feeder		Station Building	Remarks
			Frequency Band (MHz)	Power (W)	Type	Q'ty	Height (m)		Type	Length (m)		
1	DSI Adana (FFW Center)	Base Simplex	400MHz	10	5EL Yagi / B	1	40	45	AFZE50-4	45	Existing	Tower is shared with multiplex radio system.
		Base Mobile Simplex	400MHz	10	(3) Colinear antenna	1	40		AFZE50-4	45		
		SC Duplex	400MHz	25 x 2	5EL Yagi / B	2	40		AFZE50-4	45 x 2		
2	Yenice	SC Duplex	400MHz	25	5EL Yagi / B	1	15	20	10D-2E	20	Existing	
3	Doğankent	SC Duplex	400MHz	25	5EL Yagi / B	1	15	20	10D-2E	20	Existing	
4	Karayusufulu	Fixed Simplex	400MHz	10	8EL Yagi / B	1	15	20	10D-2E	20	Existing	
5	Taşcı	Fixed Simplex	400MHz	10	8EL Yagi / B	1	15	20	10D-2E	20	Existing	
6	Kuranşa	Fixed Simplex	400MHz	10 x 2	8EL Yagi 8EL Yagi	2(T) 2(R)	15	20	10D-2E	20(T) 20(R)	Existing	
		Duplex Repeater stn.	400MHz	10 x 2	(3) Colinear antenna	2	15		10D-2E	20(T) 20(R)		
7	Tabaklar	Fixed Simplex	400MHz	10	8EL Yagi / B	1	15	20	10D-2E	20	Existing	
8	Baharlı	Fixed Simplex	400MHz	10	8EL Yagi / B	1	15	20	10D-2E	20	Existing	
9	Patrol car	Mobile Simplex	400MHz	10	Whip antenna	1	-	-	5D-2V	6	-	

Note: Yagi / B: Broad band Yagi antenna

Table 2.6.1 Design Particular of Power Supply Facility (1/3)

Name of Station	Kind of Station	Uninterruptible System	Design Value of Uninterrupible Hours	Design Particular					
				Isolation Transformer (V/kVA)	Standby Diesel Engine Generator (V/kVA)	CVCF (V/A)	DC Power Supply Equip. (V/A)	Solar Battery Panel (V/W)	Storage Battery (V/AH)
DSİ 6 th Regional Directorate	Control Center	DEG+CVCF	10 minutes (CVCF)	AC 220V/15 kVA	AC 220 V/20 kVA	AC 220 V/10 kVA			
DSİ General Directorate	DM station	CVCF	10 minutes (CVCF)	AC 220 V/5 kVA		AC 220 V/2 kVA			
Seyhan Dam Office	TM /DM station	DEG+DCP+CVCF	6 hours/10 minutes	AC 220 V/7.5 kVA	AC 220 V/10 kVA	AC 220 V/2 kVA	DC 24 V/60 A		DC 24 V/300 AH
Çatalan Dam Office	DM/MUX station	DEG+DCP+CVCF	6 hours/10 minutes	AC 220 V/7.5 kVA	AC 220 V/10 kVA	AC 220 V/2 kVA	DC 24 V/60 A		DC 24 V/300 AH
EİE Adana Regional Directorate	DM station	CVCF	10 minutes	AC 220 V/5 kVA		AC 220 V/2 kVA			
DMİ Adana regional Directorate	DM station	CVCF	10 minutes	AC 220 V/5 kVA		AC 220 V/2 kVA			
Ziyaret T.	MUX repeater	DEG+DCP	6 hours (DCP)	AC 220 V/5 kVA	AC 220 V/10 kVA		DC 24 V/60 A		DC 24 V/300 AH
Karlık T.	MUX/TM repeater	DEG+DCP	6 hours (DCP)	AC 220 V/5 kVA	AC 220 V/10 kVA		DC 24 V/60 A		DC 24 V/300 AH
Nemec T.	MUX repeater	DEG+DCP	6 hours (DCP)	AC 220 V/5 kVA	AC 220 V/10 kVA		DC 24 V/60 A		DC 24 V/300 AH
Feke Dağı	MUX/TM repeater	DEG+DCP	6 hours (DCP)	AC 220 V/5 kVA	AC 220 V/10 kVA		DC 24 V/60 A		DC 24 V/300 AH
Meydancık	MUX repeater	DEG+DCP	6 hours (DCP)	AC 220 V/5 kVA	AC 220 V/10 kVA		DC 24 V/60 A		DC 24 V/300 AH
Süt T.	MUX repeater	DEG+DCP	6 hours (DCP)	AC 220 V/5 kVA	AC 220 V/10 kVA		DC 24 V/60 A		DC 24 V/300 AH
Sallangac T.	TM repeater	Solar battery	30 days					DC 12 V/35 W	DC 12 V/300 AH
Bileie T.	TM repeater	Solar battery	30 days					DC 12 V/35 W	DC 12 V/300 AH
Karatas T.	TM repeater	Solar battery	30 days					DC 12 V/35 W	DC 12 V/300 AH
Alayli	TM repeater	Solar battery	30 days					DC 12 V/35 W	DC 12 V/300 AH
Kuzören T.	TM repeater	Solar battery	30 days					DC 12 V/43 W	DC 12 V/400 AH
Kilkoyak T.	TM repeater	Solar battery	30 days					DC 12 V/35 W	DC 12 V/300 AH
Sirvan Dağı	TM repeater	Solar battery	30 days					DC 12 V/43 W	DC 12 V/400 AH
Doğankent ASO office	Liaison station	DCP	5 days	AC 220 V/1 kVA			DC 12 V/5 A		DC 12 V/100 AH
Yenice ASO office	Liaison station	DCP	5 days	AC 220 V/1 kVA			DC 12 V/5 A		DC 12 V/100 AH
Kuranşa	Liaison repeater	DCP	5 days	AC 220 V/1 kVA			DC 12 V/15 A		DC 12 V/300 AH

Abbreviation : TM ; Telemetering, DM ; Data Monitoring, MUX ; Multiplex Radio, DEG ; Diesel Engine Generator, DCP ; DC Power Supply Equipment, CVCF ; Constant Volatge Constant Frequency

Table 2.6.2 Design Particular of Power Supply Facility (2/3)

Name of Station	Kind of Station	Uninterruptible System	Design Value of Uninterruptible Hours	Design Particular					
				Isolation Transformer (V/kVA)	Standby Diesel Engine Generator (V/kVA)	CVCF (V/A)	DC Power Supply Equip. (V/A)	Solar Battery Panel (V/W)	Storage Battery (V/AH)
Taşı town head's office	Liaison station	DCP	5 days	AC 220 V/1 kVA			DC 12 V/5 A		DC 12 V/100 AH
Karayusufulu town head's office	Liaison station	DCP	5 days	AC 220 V/1 kVA			DC 12 V/5 A		DC 12 V/100 AH
Baharlı town head's office	Liaison station	DCP	5 days	AC 220 V/1 kVA			DC 12 V/5 A		DC 12 V/100 AH
Tabaklar town head's office	Liaison station	DCP	5 days	AC 220 V/1 kVA			DC 12 V/5 A		DC 12 V/100 AH
Çamardı	RG Station	Solar battery	30 days					DC 12 V/10 W	DC 12 V/100 AH
Çiftehan	RG Station	Solar battery	30 days					DC 12 V/10 W	DC 12 V/100 AH
Pozantı	RG/TP Station	Solar battery	30 days					DC 12 V/35 W	DC 12 V/300 AH
Kamışlı	RG/TP Station	Solar battery	30 days					DC 12 V/35 W	DC 12 V/300 AH
Karaisalı	RG Station	Solar battery	30 days					DC 12 V/10 W	DC 12 V/100 AH
Karsantı	RG/TP Station	Solar battery	30 days					DC 12 V/35 W	DC 12 V/300 AH
1825	WL Station	Solar battery	30 days					DC 12 V/10 W	DC 12 V/100 AH
1820	WL Station	Solar battery	30 days					DC 12 V/10 W	DC 12 V/100 AH
1818	WL Station	Solar battery	30 days					DC 12 V/10 W	DC 12 V/100 AH
1828	WL Station	Solar battery	30 days					DC 12 V/10 W	DC 12 V/100 AH
Kazancık	RG Station	Solar battery	30 days					DC 12 V/10 W	DC 12 V/100 AH
Pınarbaşı	RG Station	Solar battery	30 days					DC 12 V/10 W	DC 12 V/100 AH
Toklar	RG Station	Solar battery	30 days					DC 12 V/10 W	DC 12 V/100 AH
Tomarza	RG/TP Station	Solar battery	30 days					DC 12 V/35 W	DC 12 V/300 AH
Şeyhli	RG/TP Station	Solar battery	30 days					DC 12 V/35 W	DC 12 V/300 AH
1822	WL Station	Solar battery	30 days					DC 12 V/10 W	DC 12 V/100 AH
1806	WL Station	Solar battery	30 days					DC 12 V/10 W	DC 12 V/100 AH
Tufanbeyli	RG/TP Station	Solar battery	30 days					DC 12 V/35 W	DC 12 V/300 AH

Abbreviation : DCP; DC Power Supply Equipment, RG; Rainfall, TP ; Temperature, WL ; Water Level

Table 2.6.3 Design Particular of Power Supply Facility (3/3)

Name of Station	Kind of Station	Uninterruptible System	Design Value of Uninterrupible Hours	Design Particular					
				Isolation Transformer (V/kVA)	Standby Diesel Engine Generator (V/kVA)	CVCF (V/A)	DC Power Supply Equip. (V/A)	Solar Battery Panel (V/W)	Storage Battery (V/AH)
Saimbeyli	RG Station	Solar battery	30 days					DC 12 V/10 W	DC 12 V/100 AH
Feke	RG Station	Solar battery	30 days					DC 12 V/10 W	DC 12 V/100 AH
Mansurlu	RG/TP Station	Solar battery	30 days					DC 12 V/35 W	DC 12 V/300 AH
1801	WL Station	Solar battery	30 days					DC 12 V/10 W	DC 12 V/100 AH
1805	WL Station	Solar battery	30 days					DC 12 V/10 W	DC 12 V/100 AH

Abbreviation : DCP; DC Power Supply Equipment, RG; Rainfall, TP ; Temperature, WL ; Water Level

Table 2.7.1 Design Particular of Gauging Equipment for Each Gauging Station

No.	Name of Station	Kind of Station	Rainfall Gauging Equipment			Temperature Gauging Equipment				Water Level Gauging Equipment						Remarks
			Type	Unit	Automatic Recorder	Type	Accuracy	Measuring Range	Automatic Recorder	Type	Accuracy	Measuring Range	Automatic Recorder	Distance Between Sensor and House	Well Construction	Station Housing
	Seyhan River Basin															
1	Çamardı	RG Station	Tipping	1 mm/tip	3 -month											New construction
2	Çiftehan	RG Station	Tipping	1 mm/tip	3 -month											New construction
3	Pozantı	RG/TP Station	Tipping	1 mm/tip	3 -month	Pt Resistance	±0.15°C	-50°C to +50°C	3 -month							New construction
4	Kamışlı	RG/TP Station	Tipping	1 mm/tip	3 -month	Pt Resistance	±0.15°C	-50°C to +50°C	3 -month							New construction
5	Karaisalı	RG Station	Tipping	1 mm/tip	3 -month											New construction
6	Karsantı	RG/TP Station	Tipping	1 mm/tip	3 -month	Pt Resistance	±0.15°C	-50°C to +50°C	3 -month							New construction
7	1825	WL Station								Float	Within ±1 cm	0 to 10 m	3-month	Approx. 15 m	New construction	New construction
8	1820	WL Station								Float	Within ±1 cm	0 to 10 m	3-month	Approx. 10 m	New construction	New construction
9	1818	WL Station								Float	Within ±1 cm	0 to 10 m	3-month	Approx. 50 m	New construction	New construction
10	1828	WL Station								Float	Within ±1 cm	0 to 10 m	3-month	Approx. 20 m	New construction	New construction
11	Seyhan dam	WL Station								Pressure	0.05%FS or less	0 to 40 m	3-month	Approx. 1,500 m		New construction
12	Çatalan dam	RG/WL Station	Tipping	1 mm/tip	3 -month					Pressure	0.05%FS or less	0 to 40 m	3-month	Approx. 1,500 m		New construction
	Zamantı River Basin															
13	Kazancık	RG Station	Tipping	1 mm/tip	3 -month											New construction
14	Pınarbaşı	RG Station	Tipping	1 mm/tip	3 -month											New construction
15	Toklar	RG Station	Tipping	1 mm/tip	3 -month											New construction
16	Tomarza	RG/TP Station	Tipping	1 mm/tip	3 -month	Pt Resistance	±0.15°C	-50°C to +50°C	3 -month							New construction
17	Şeyhli	RG/TP Station	Tipping	1 mm/tip	3 -month	Pt Resistance	±0.15°C	-50°C to +50°C	3 -month							New construction
18	1822	WL Station								Float	Within ±1 cm	0 to 10 m	3-month	Inside station	New construction	New construction
19	1806	WL Station								Float	Within ±1 cm	0 to 10 m	3-month	Approx. 30 m	New construction	New construction
	Göksu River Basin															
20	Tufanbeyli	RG/TP Station	Tipping	1 mm/tip	3 -month	Pt Resistance	±0.15°C	-50°C to +50°C	3 -month							New construction
21	Saimbeyli	RG Station	Tipping	1 mm/tip	3 -month											New construction
22	Feke	RG Station	Tipping	1 mm/tip	3 -month											New construction
23	Mansurulu	RG/TP Station	Tipping	1 mm/tip	3 -month	Pt Resistance	±0.15°C	-50°C to +50°C	3 -month							New construction
24	1801	WL Station								Float	Within ±1 cm	0 to 10 m	3-month	Approx. 10 m	New construction	New construction
25	1805	WL Station								Float	Within ±1 cm	0 to 10 m	3-month	Approx. 20 m	New construction	New construction

Abbreviation : RG; Rainfall, TP ; Temperature, WL ; Water Level

Tabe 3.1.1 Implementation Schedule for Seyhan River Basin Flood Forecasting and Warning System

Items \ Month	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	17th	18th	19th	20th	21th	22th	23th
1. Detailed Design and Tender																							
(1) Detailed design																							
(2) Supplemental radio wave propagation test																							
(3) Tender documentation																							
(4) Tender processing																							
2. Civil construction work																							
(1) Preparatory work																							
(2) Civil construction work																							
3. Equipment Manufacture and Installation/Adjustment Work																							
(1) Design																							
(2) Equipment manufacture																							
(3) Inspection																							
(4) Transportation and customs clearance processing														▽ FOB									
(5) Equipment installation																							
(6) Equipment adjustment																					Taking Over		
(7) Acceptance test																							
4. Education and Training																							
(1) Overseas OJT																							
(2) Site OJT																							

Table 3.2.1 Project Cost

Item No.	Item	Foreign Currency Unit : $	Domestic Currency Unit : 1,000 TL	Remarks
1	Direct Construction Cost			
1.1	Equipment Cost			
1)	Telemetering Facility	1,702,290	0	
2)	Data Processing Facility	1,216,960	0	
3)	Data Display Facility	1,609,790	0	
4)	Multiplex Radio Communication Facility	1,486,530	0	
5)	Voice-based Radio Communication Facility	377,180	0	
6)	Power Supply Facility	1,500,660	0	
7)	Spare Units and Parts	473,590	0	
8)	Test Equipment and Maintenance Vehicle	279,770	0	
9)	Materials	357,400	0	
Sub-total		9,004,170	0	
1.2	Civil Construction Cost			
1)	Tower Construction Cost	0	1,041,400	
2)	Housing Construction Cost	0	5,229,700	
3)	Electricity Service Lines Construction Cost	0	3,889,500	
4)	Other Attached Construction Cost	0	7,372,800	
Sub-total		0	17,533,400	
1.3	Equipment Installation and Adjustment Cost			
1)	PTT Private Line Initiate Installation Cost	0	18,400	
2)	Manpower Cost	1,002,570	780,500	
3)	Machine Cost	89,750	0	
4)	Vehicles for Installation	0	1,189,000	
Sub-total		1,092,320	1,987,900	
1.4	Inland Transportation Cost			
1)	Inland Transportation Cost	0	47,600	
2)	Unloading and Warehouse Cost	0	176,500	(9,540$)
Sub-total		0	224,100	
2	Land Acquisition Cost	0	6,600	
3	Project Overhead Fee by Government	0	197,454	
4	Engineering Fee	1,170,200	0	
5	Training Fee	148,580	0	Overseas/Site OJT
6	Provisional Preliminary Fee	554,870	2,630,010	
Grand Total		11,970,140	22,579,464	

Note: Project cost should be estimated using following foreign exchange currency rate.

(1) 1$=109.2 Yen as of February 1, 1994

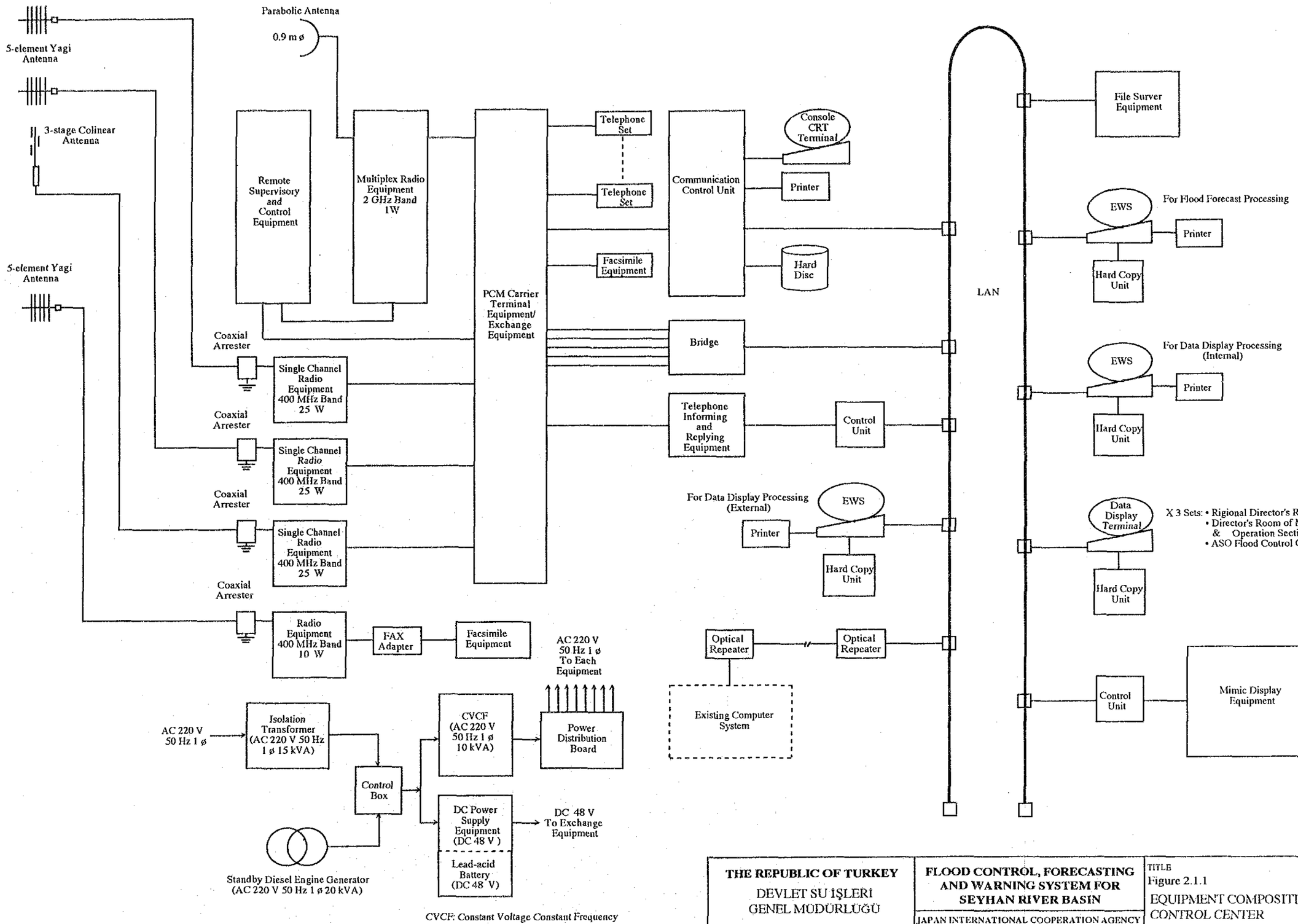
(2) 1$=18,500 TL as of Febuary, 1994

Table 3.2.2 Cost Breakdown of Each Station

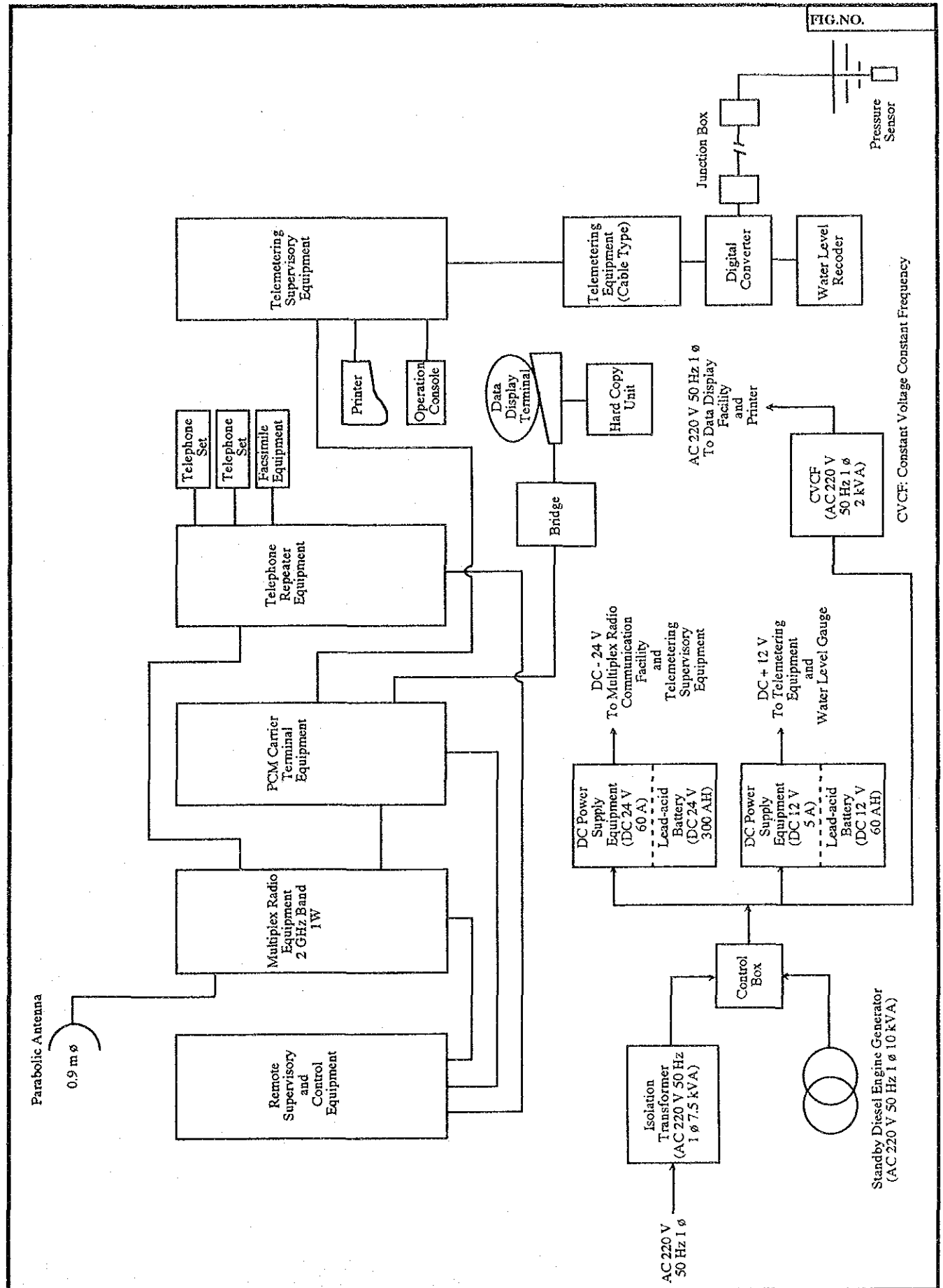
	Quantity	Unit Price ($)	Total ($)	Cost Composition of Each Station Facility								
				Telemetering Facility	Processing Facility	Multiplex Facility	Contact Telephone	Displaying Facility	Power Supply Facility	Spare Parts and Units	Test Equipment	Installation Materials
1. Control Center	1	2,955,991	2,955,991	0	1,216,960	171,190	111,813	1,254,947	201,081	0	0	0
2. Seyhan Dam Office	1	568,068	568,068	255,861	0	110,632	0	62,454	139,121	0	0	0
3. Çatalan Dam Office	1	475,686	475,686	79,112	0	206,722	0	62,453	127,399	0	0	0
4. Data Monitoring Station	3	111,904	335,712	0	0	0	0	76,648	35,256	0	0	0
5. Multiplex Repeater Station (Ziyaret T.)	1	333,196	333,196	0	0	243,910	0	0	89,286	0	0	0
6. Multiplex Repeater Station (Karlık T.)	1	282,253	282,253	0	0	192,967	0	0	89,286	0	0	0
7. Multiplex Repeater Station (Nemec T.)	1	234,112	234,112	0	0	144,826	0	0	89,286	0	0	0
8. Multiplex Repeater Station (Feke Dağı)	1	276,850	276,850	0	0	187,564	0	0	89,286	0	0	0
9. Multiplex Repeater Station (Meydancik)	1	224,881	224,881	0	0	135,595	0	0	89,286	0	0	0
10. Multiplex Repeater Station (Kilkoyak T.)	1	182,409	182,409	0	0	93,123	0	0	89,286	0	0	0
11. Telemetering Repeater Station (V-V)	5	63,049	315,245	49,313	0	0	0	0	13,736	0	0	0
12. Telemetering Repeater Station (μ-V)	4	44,753	179,012	44,753	0	0	0	0	0	0	0	0
13. Telemetering Repeater Station (Cross)	2	107,820	215,640	89,505	0	0	0	0	18,315	0	0	0
14. Water Level Gauging Station	8	39,533	316,264	32,482	0	0	0	0	7,051	0	0	0
15. Rainfall Gauging Station	8	33,644	269,152	26,593	0	0	0	0	7,051	0	0	0
16. Rainnfall & Temperature gauging Station	7	55,183	386,281	41,447	0	0	0	0	13,736	0	0	0
17. UHF Repeater Station & Village's Head	1	134,286	134,286	0	0	0	111,392	0	22,894	0	0	0
18. Doğ ankent/Yncice Ofiice	2	23,086	46,172	0	0	0	14,020	0	9,066	0	0	0
19. Ofiice of Village's Head	4	40,550	162,200	0	0	0	31,484	0	9,066	0	0	0
20. Spare Parts and Units	1	473,590	473,590	0	0	0	0	0	0	473,590	0	0
21. Test Equipment and Maintenance Car	1	279,770	279,770	0	0	0	0	0	0	0	279,770	0
22. Installation Materials	1	357,400	357,400	0	0	0	0	0	0	0	0	357,400
Grand Total			9,004,170									

Figures

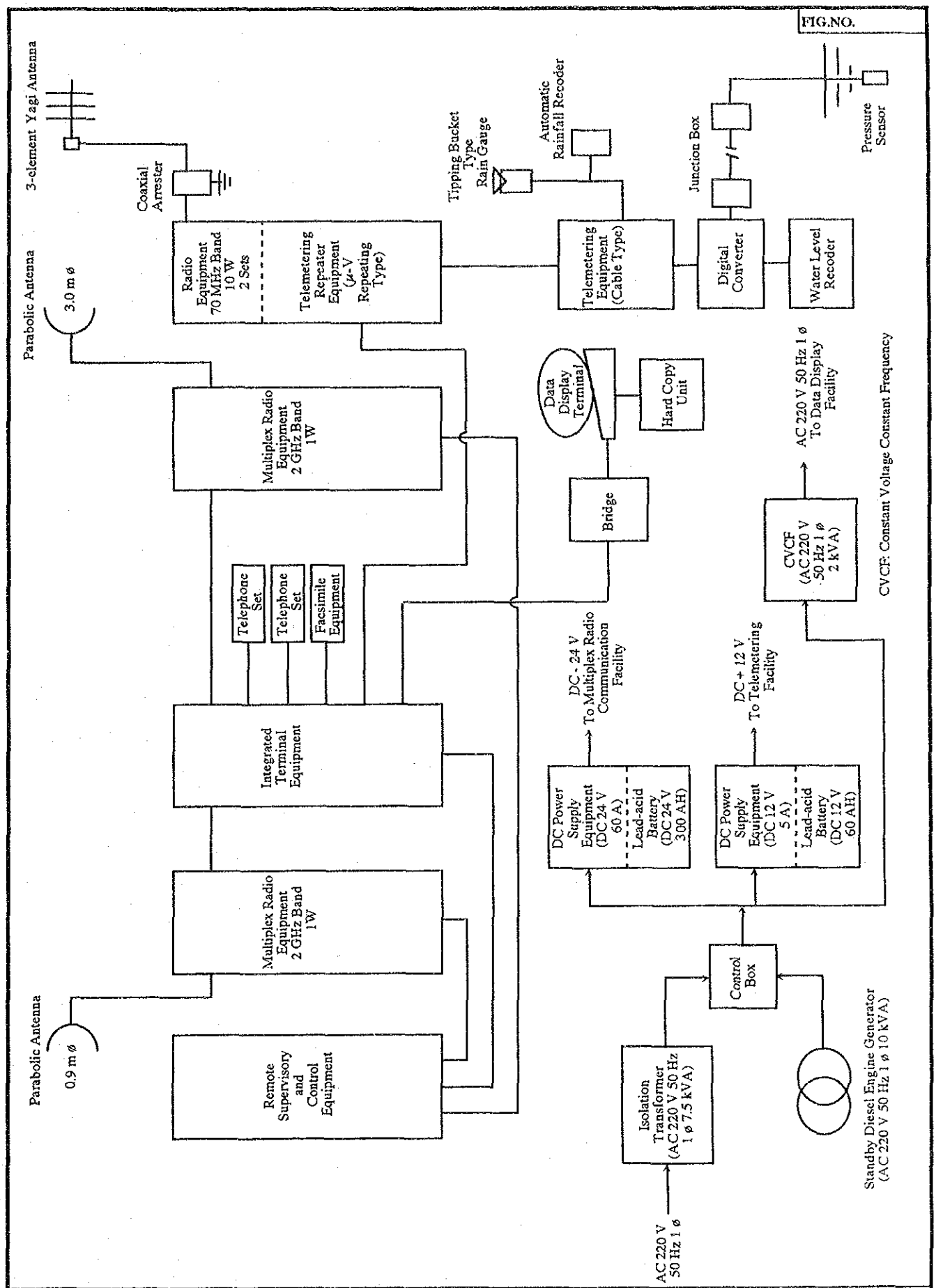
FIG.NO.



THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	**FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.1 EQUIPMENT COMPOSITION OF CONTROL CENTER

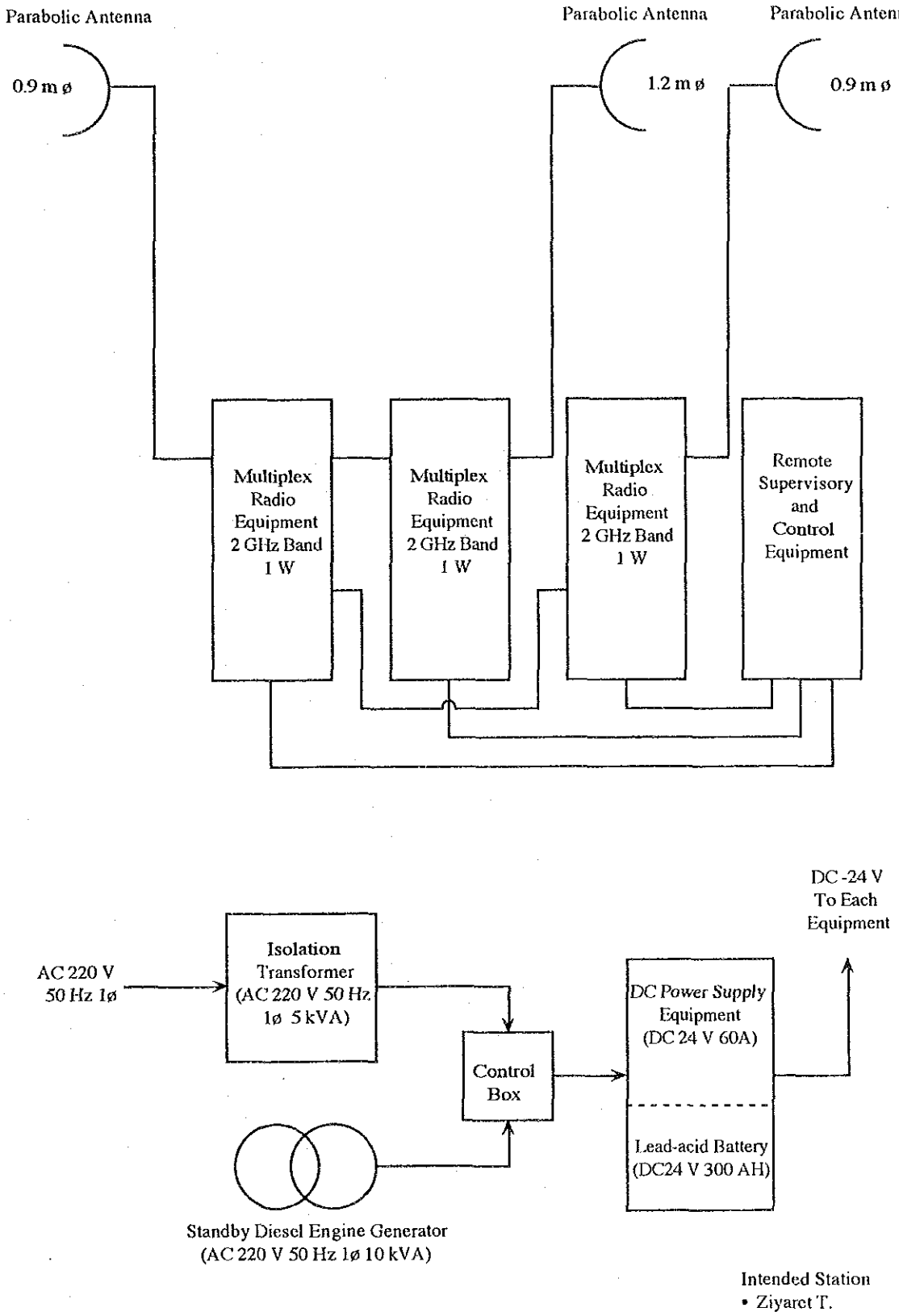


THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	**FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.2 EQUIPMENT COMPOSITION OF SEYHAN DAM OFFICE



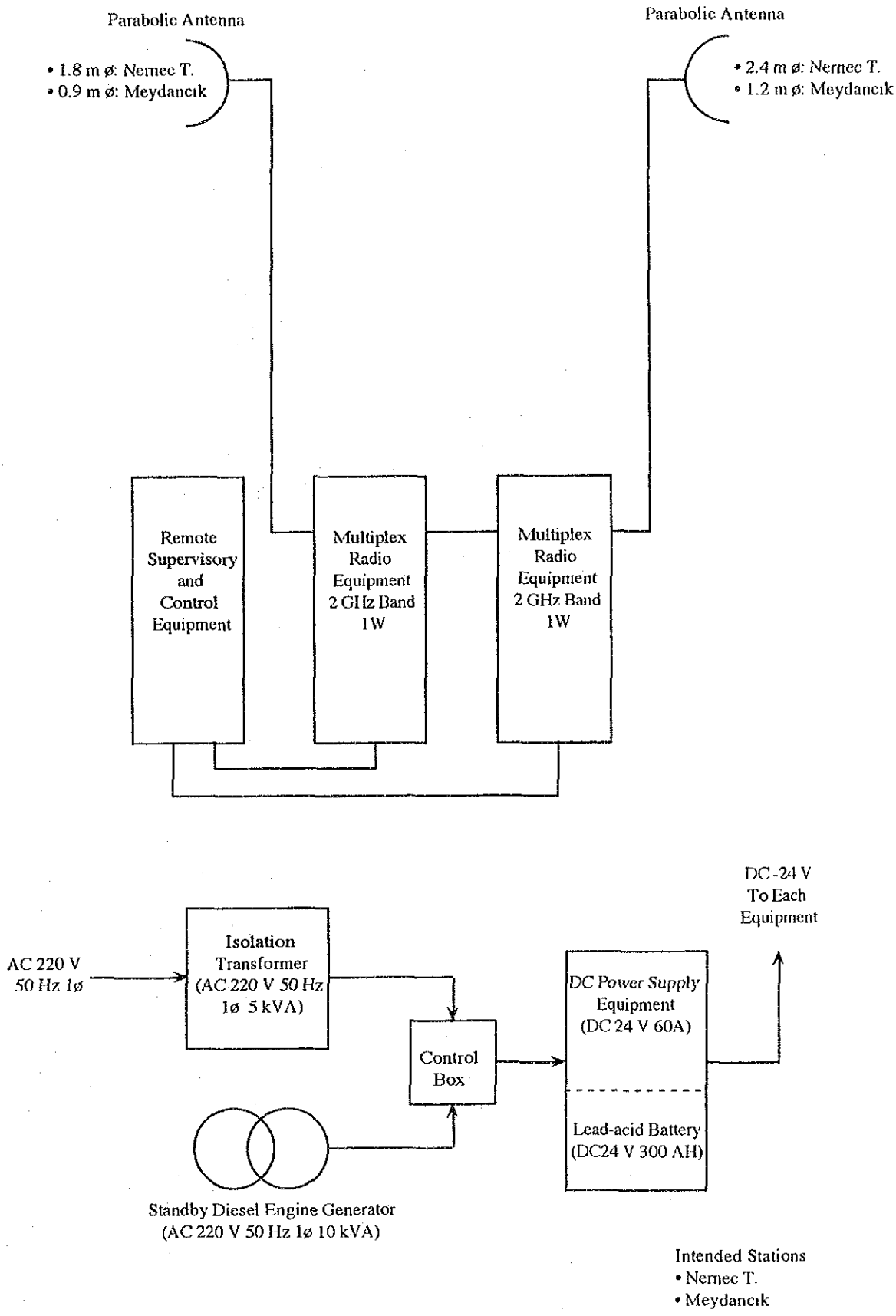
THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	**FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.3 EQUIPMENT COMPOSITION OF ÇATALAN DAM OFFICE

FIG.NO.



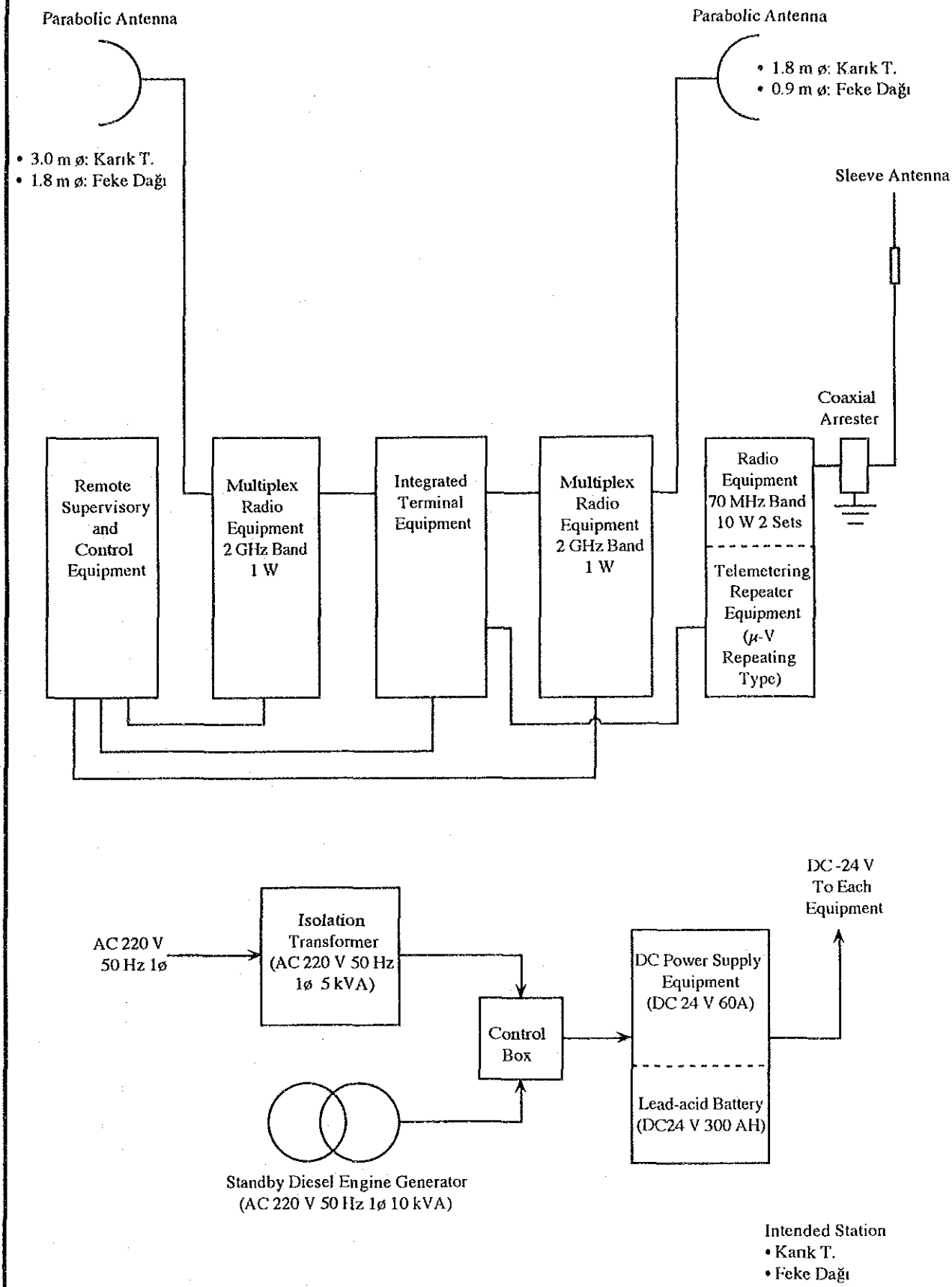
THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	**FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.4 EQUIPMENT COMPOSITION OF MULTIPLEX REPEATER STATION (1/2)

FIG.NO.



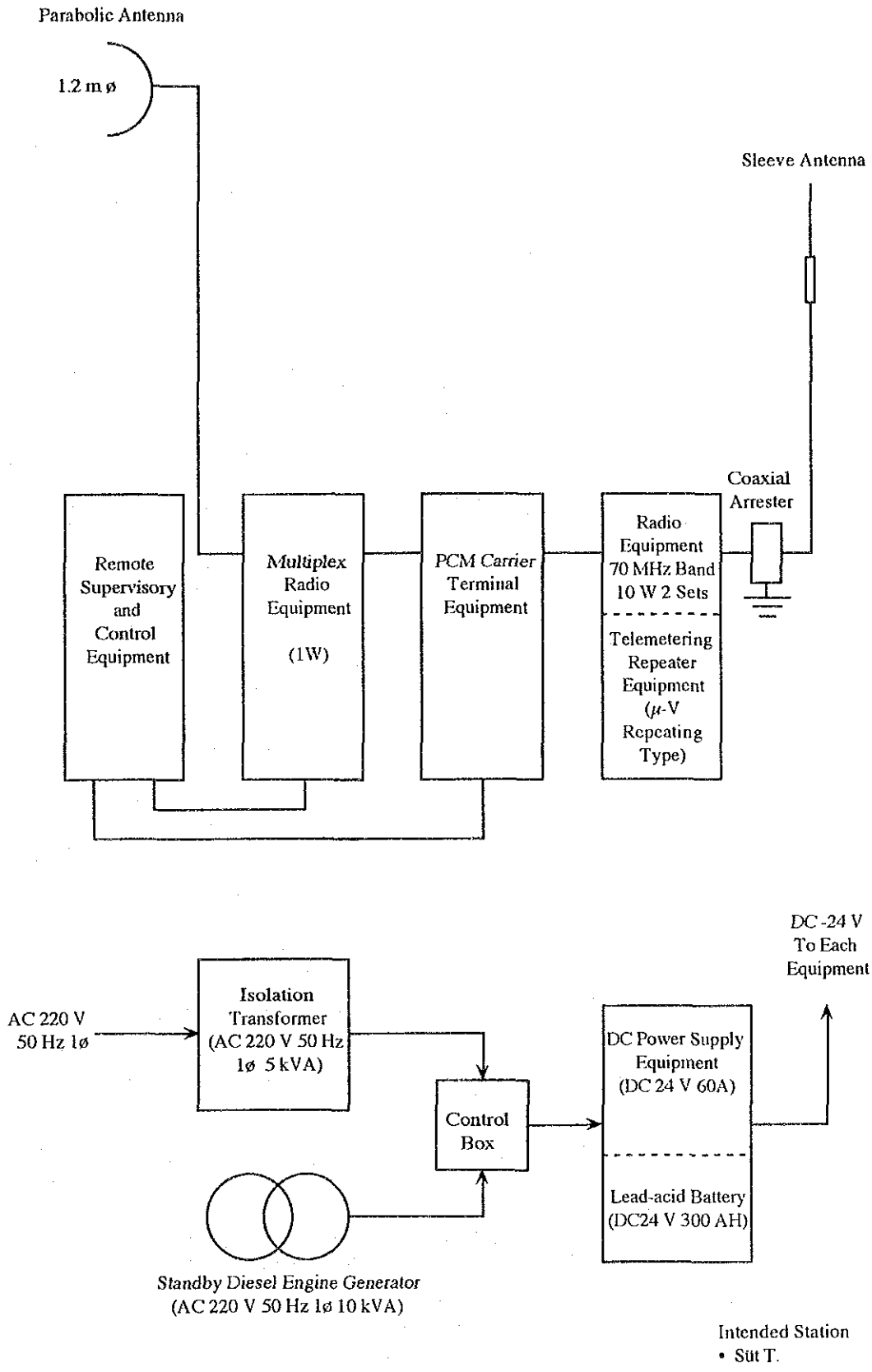
THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	**FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.5 EQUIPMENT COMPOSITION OF MULTIPLEX REPEATER STATION (2/2)

FIG.NO.



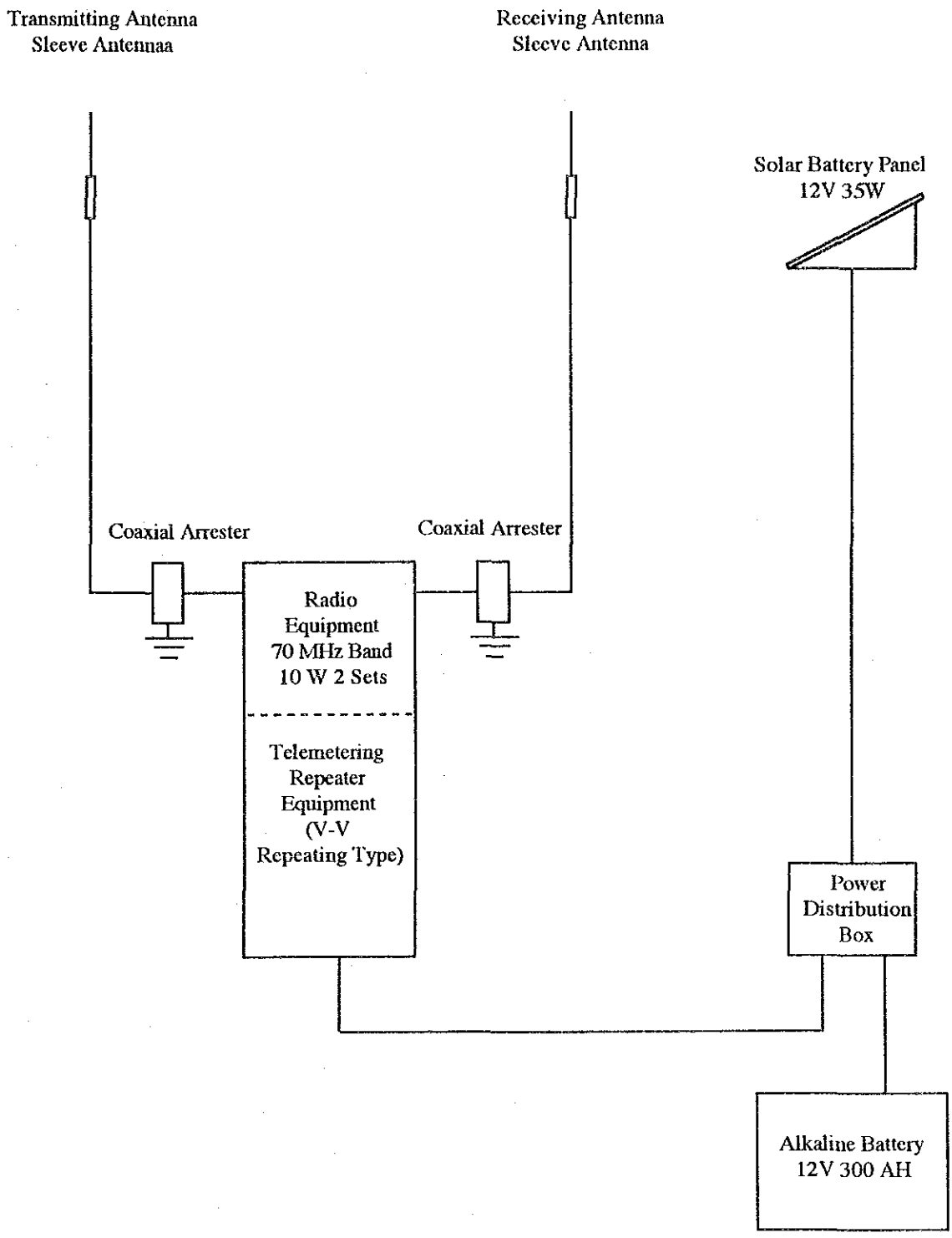
THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	**FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.6 EQUIPMENT COMPOSITION OF MULTIPLEX AND TELEMETERING REPEATER STATION (1/2)

FIG.NO.



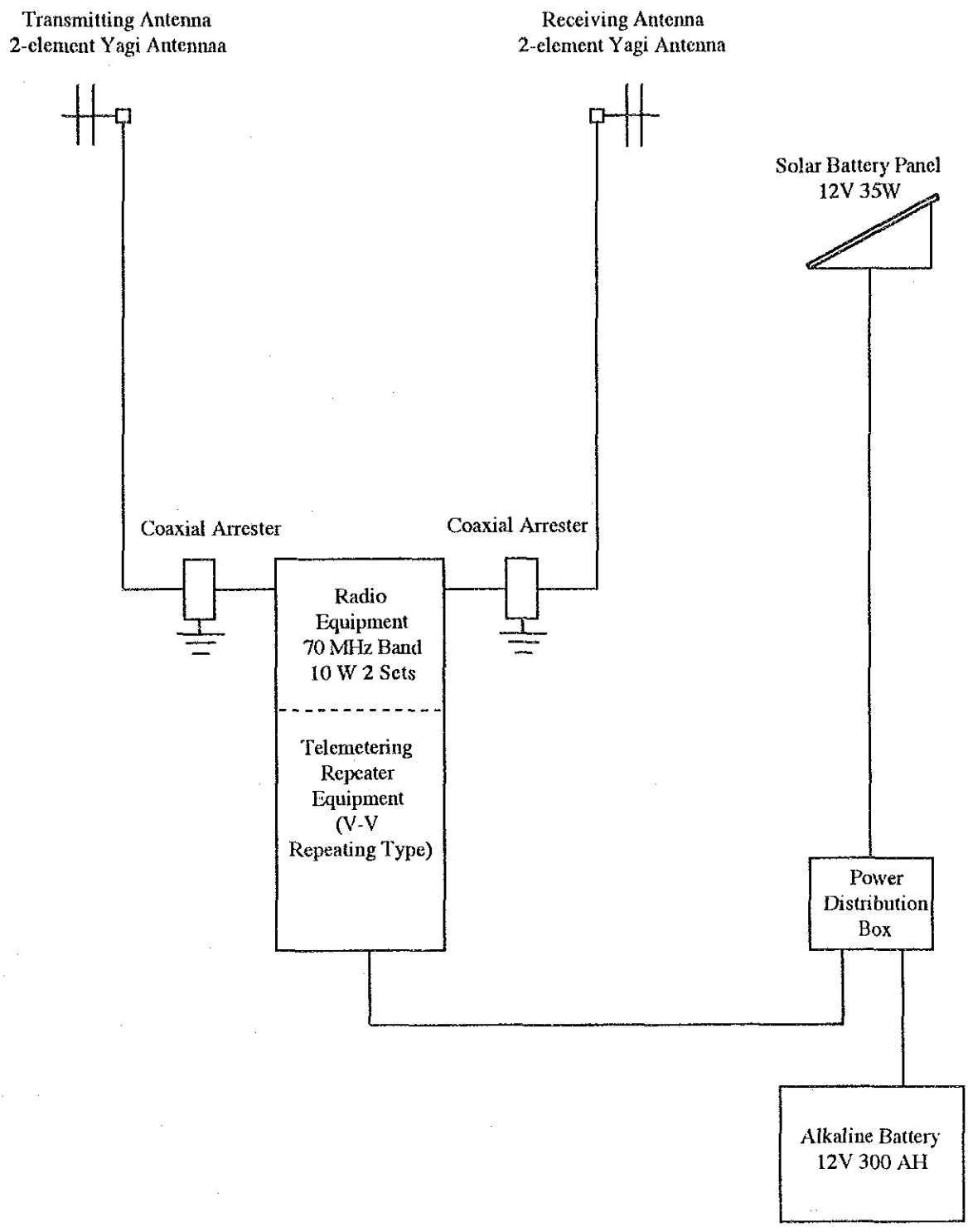
THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	**FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.7 EQUIPMENT COMPOSITION OF MULTIPLEX AND TELEMETERING REPEATER STATION (2/2)

FIG.NO.



THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	**FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.8 EQUIPMENT COMPOSITION OF TELEMETERING REPEATER STATION (V-V TYPE) (1/2)

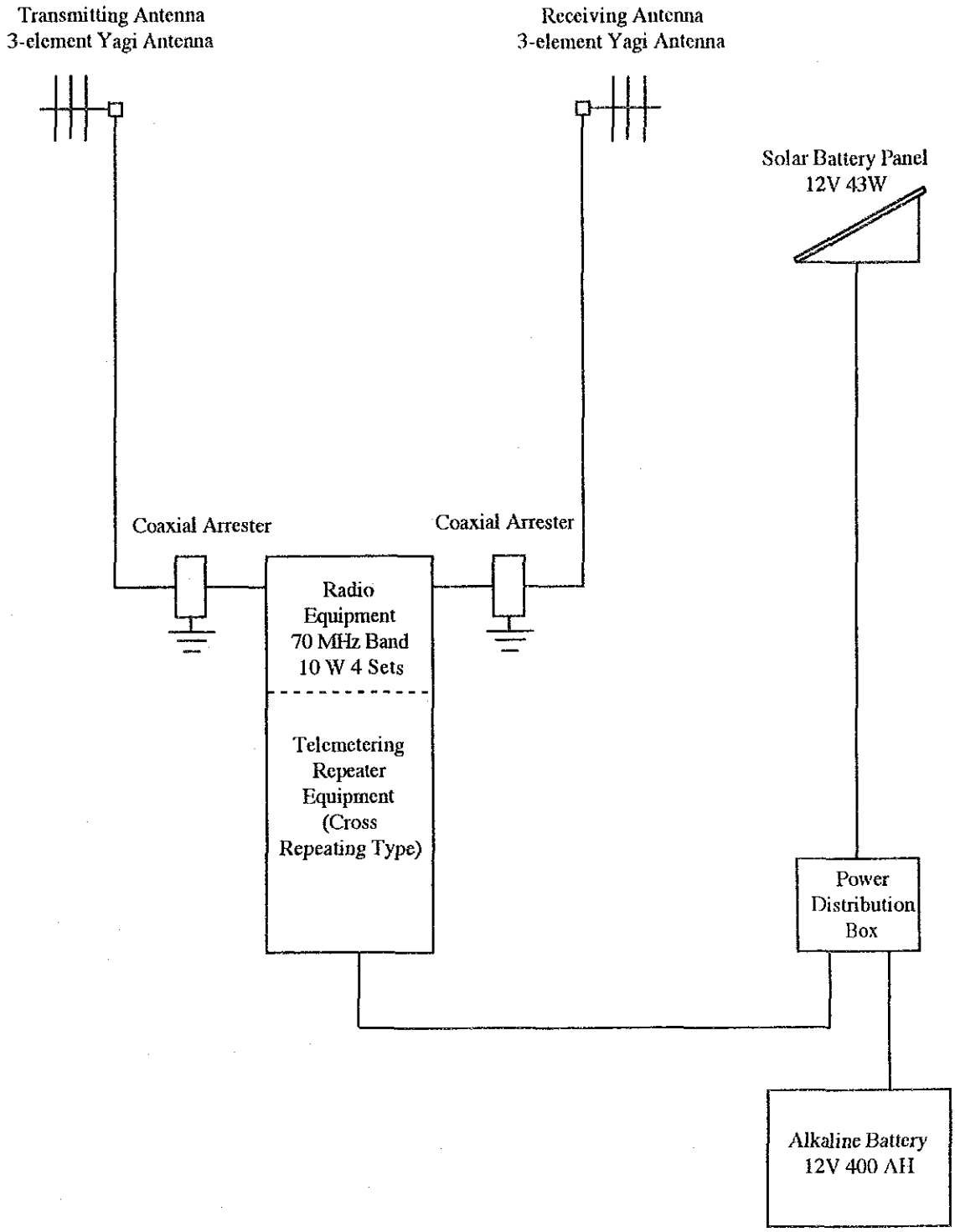
FIG.NO.



Intended Stations
- Bileğe T.
- Sallangac T.
- Ayaylı

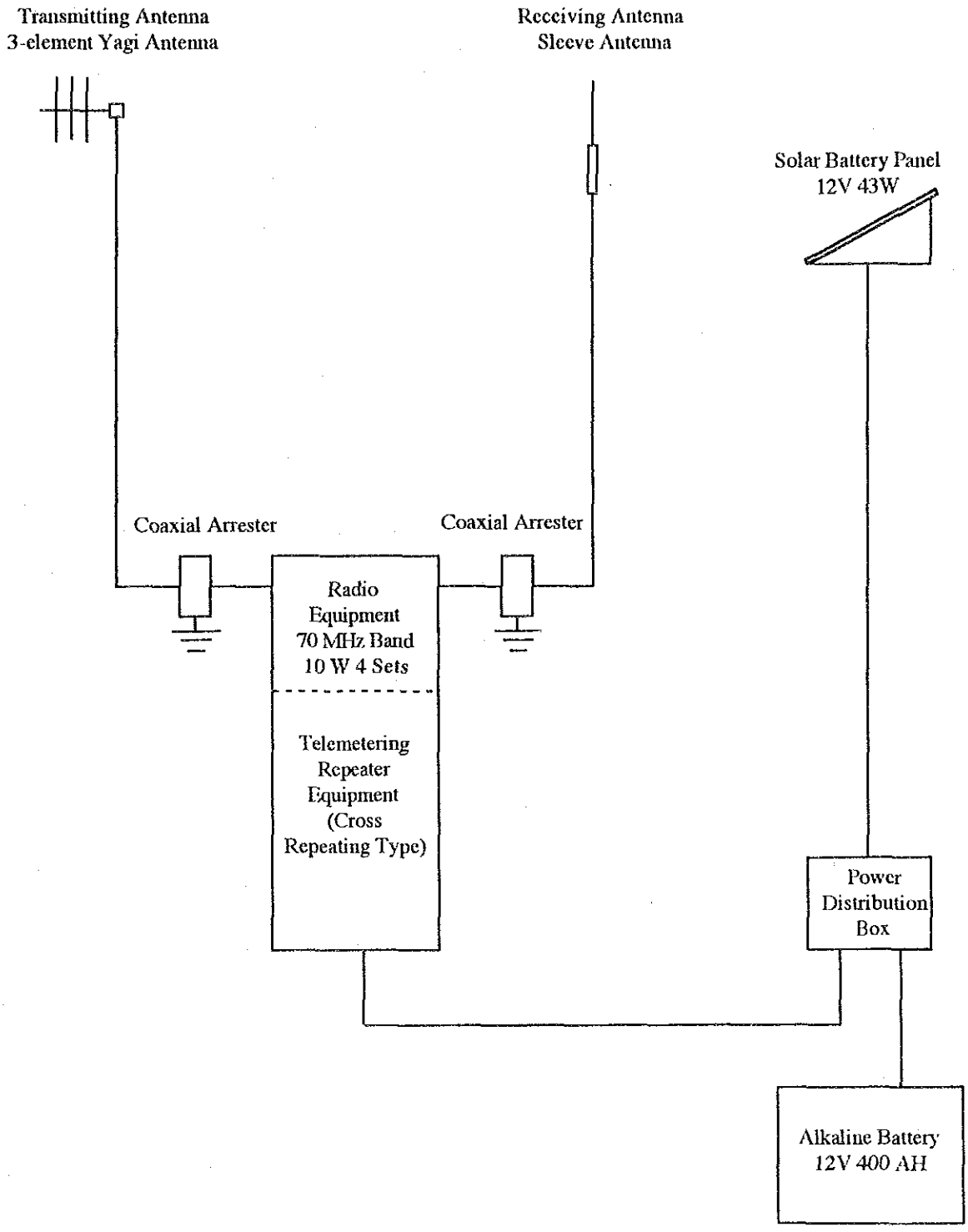
THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	**FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.9 EQUIPMENT COMPOSITION OF TELEMETERING REPEATER STATION (V-V TYPE) (2/2)

FIG.NO.



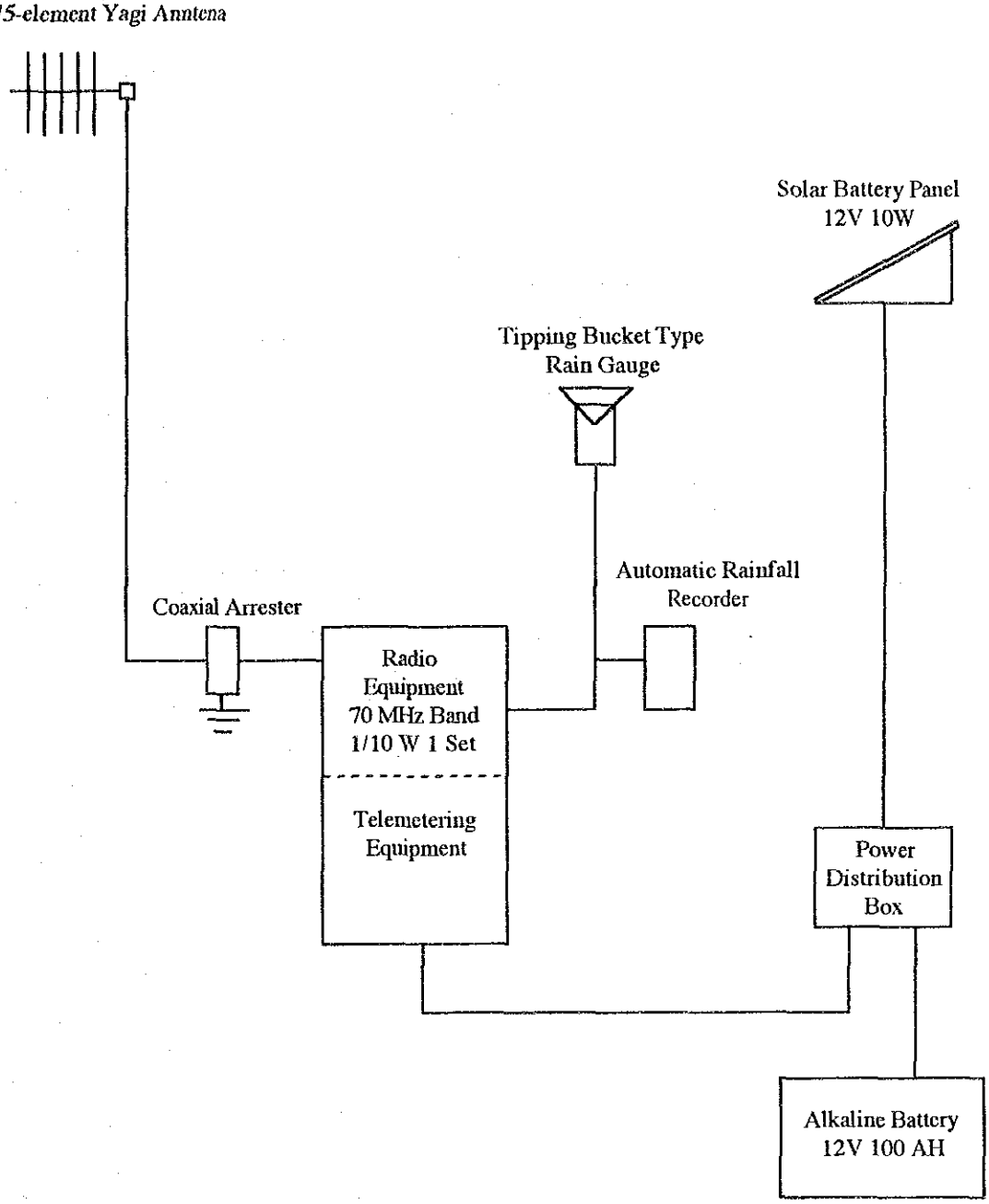
THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	**FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.10 EQUIPMENT COMPOSITION OF TELEMETERING REPEATER STATION (CROSS REPEATING TYPE) (1/2)

FIG.NO.



THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	***FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN*** *JAPAN INTERNATIONAL COOPERATION AGENCY*	TITLE Figure 2.1.11 EQUIPMENT COMPOSITION OF TELEMETERING REPEATER STATION (CROSS REPEATING TYPE) (2/2)

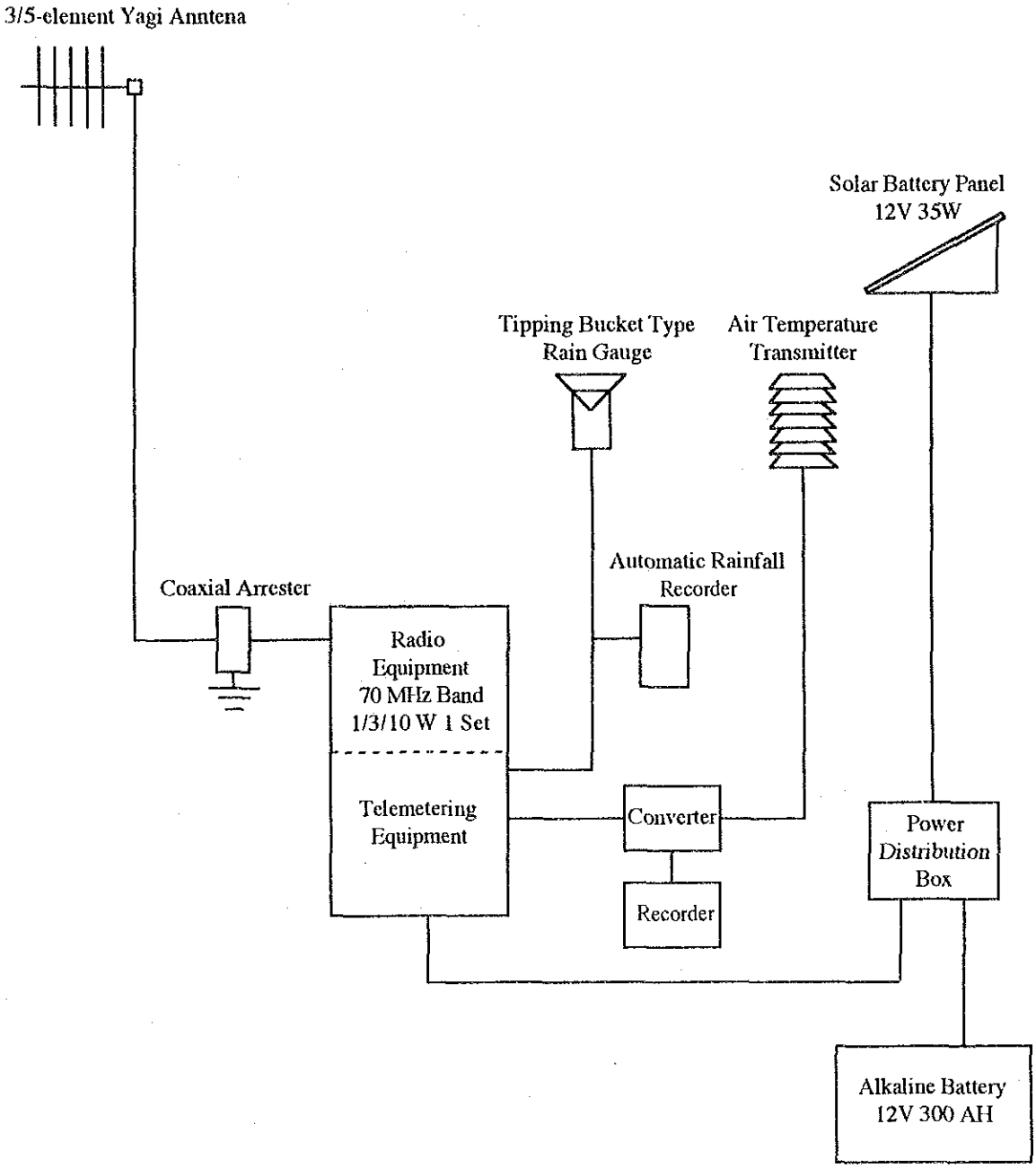
FIG.NO.



Intended Stations
- Çamardı
- Çiftehan
- Karaisali
- Feke
- Saimbeyli
- kazancık
- Pınarbaşi
- Toklar

THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	**FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.12 EQUIPMENT COMPOSITION OF RAINFALL GAUGING STATION

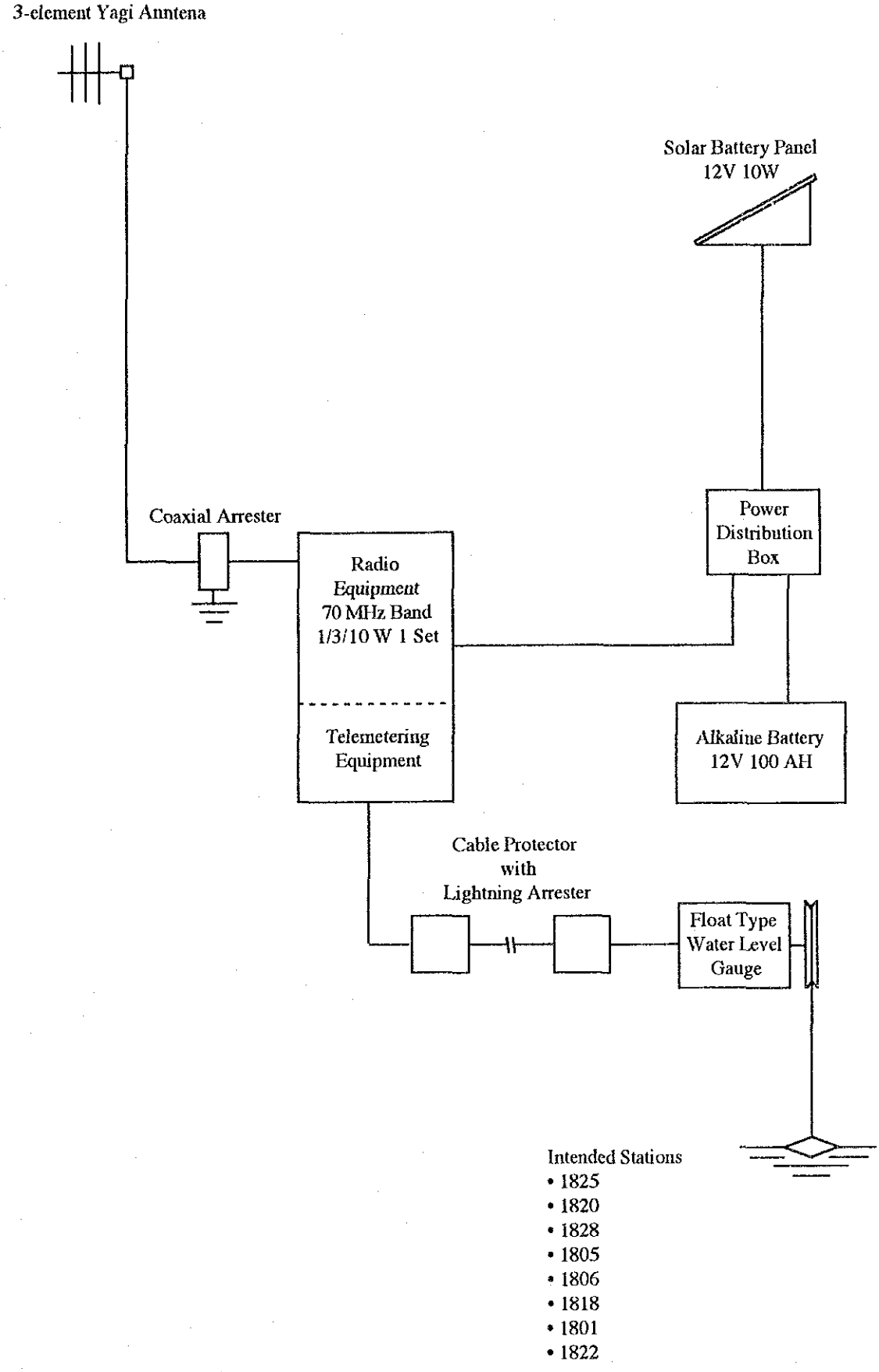
FIG.NO.



Intended Stations
- Pozantı
- Kamişli
- Karsantı
- Mansunsurlu
- Tufanbeyli
- Şeyhli
- Tomarza

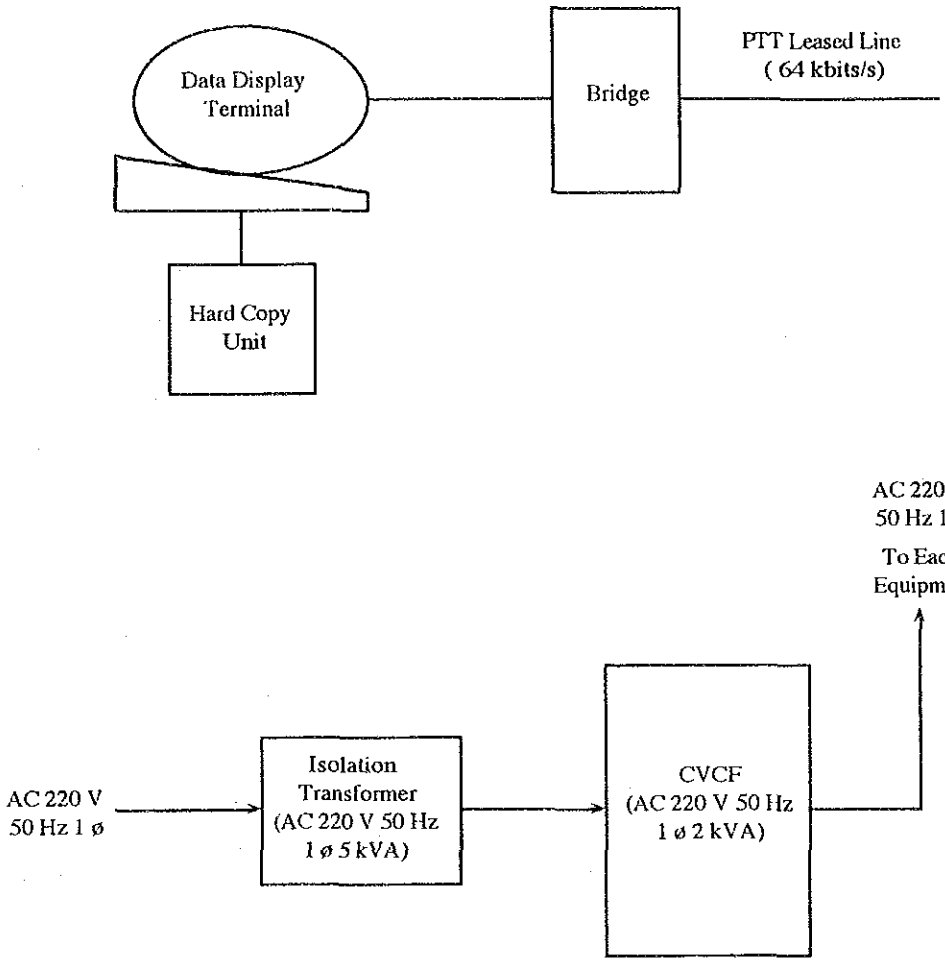
THE REPUBLIC OF TURKEY *DEVLET SU İŞLERİ* GENEL MÜDÜRLÜĞÜ	**FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.13 EQUIPMENT COMPOSITION OF RAINFALL AND TEMPERATURE GAUGING STATION

FIG.NO.



THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	**FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR *SEYHAN RIVER BASIN*** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.14 EQUIPMENT COMPOSITION OF WATER LEVEL GAUGING STATION

FIG.NO.

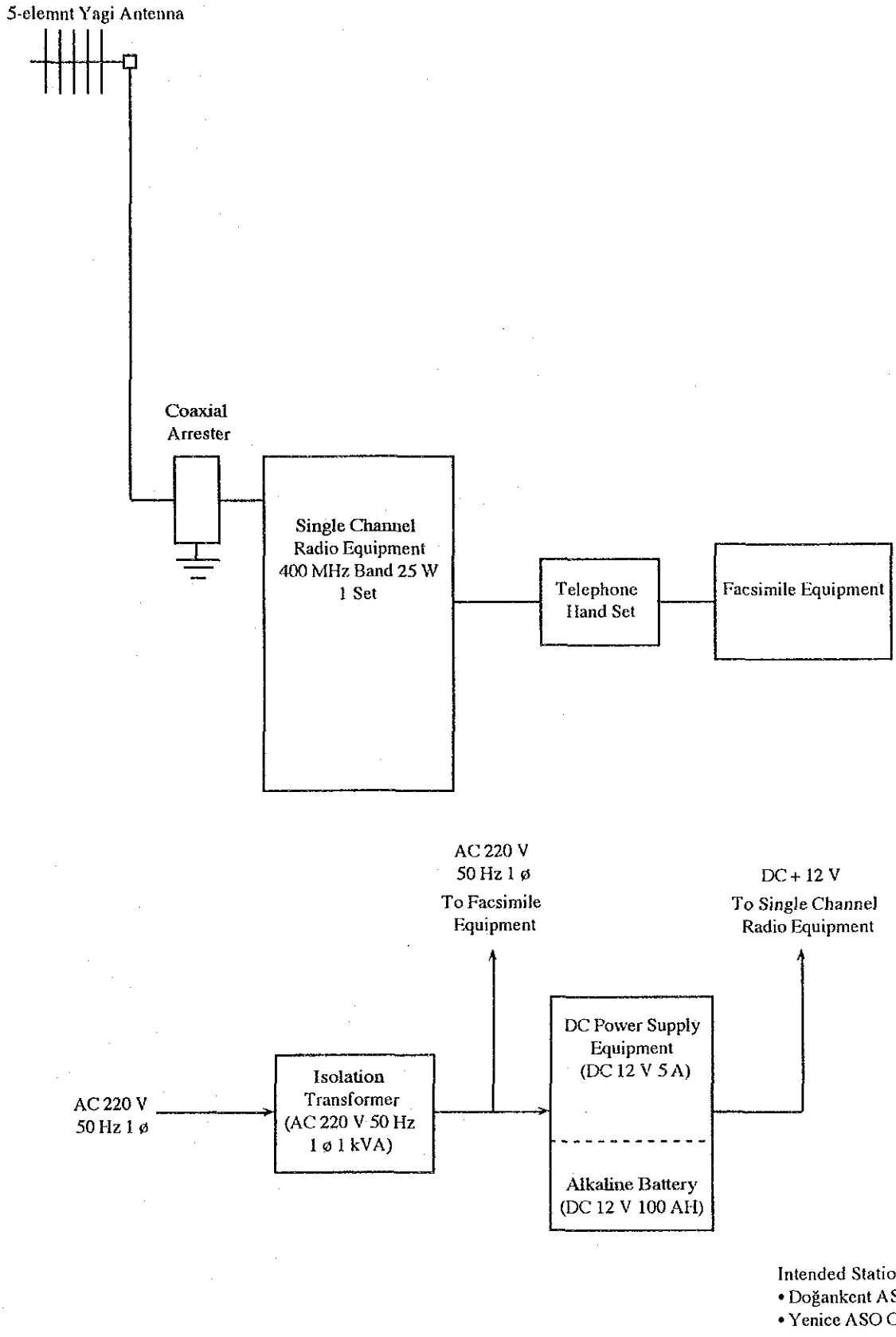


CVCF: Constant Voltage Constant Frequency

Intended Stations
- DSİ General Directorate
- EIE Adana Regional Directorate
- DMİ Adana Regional Directorate

THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	**FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.15 EQUIPMENT COMPOSITION OF DATA MONITORING STATION

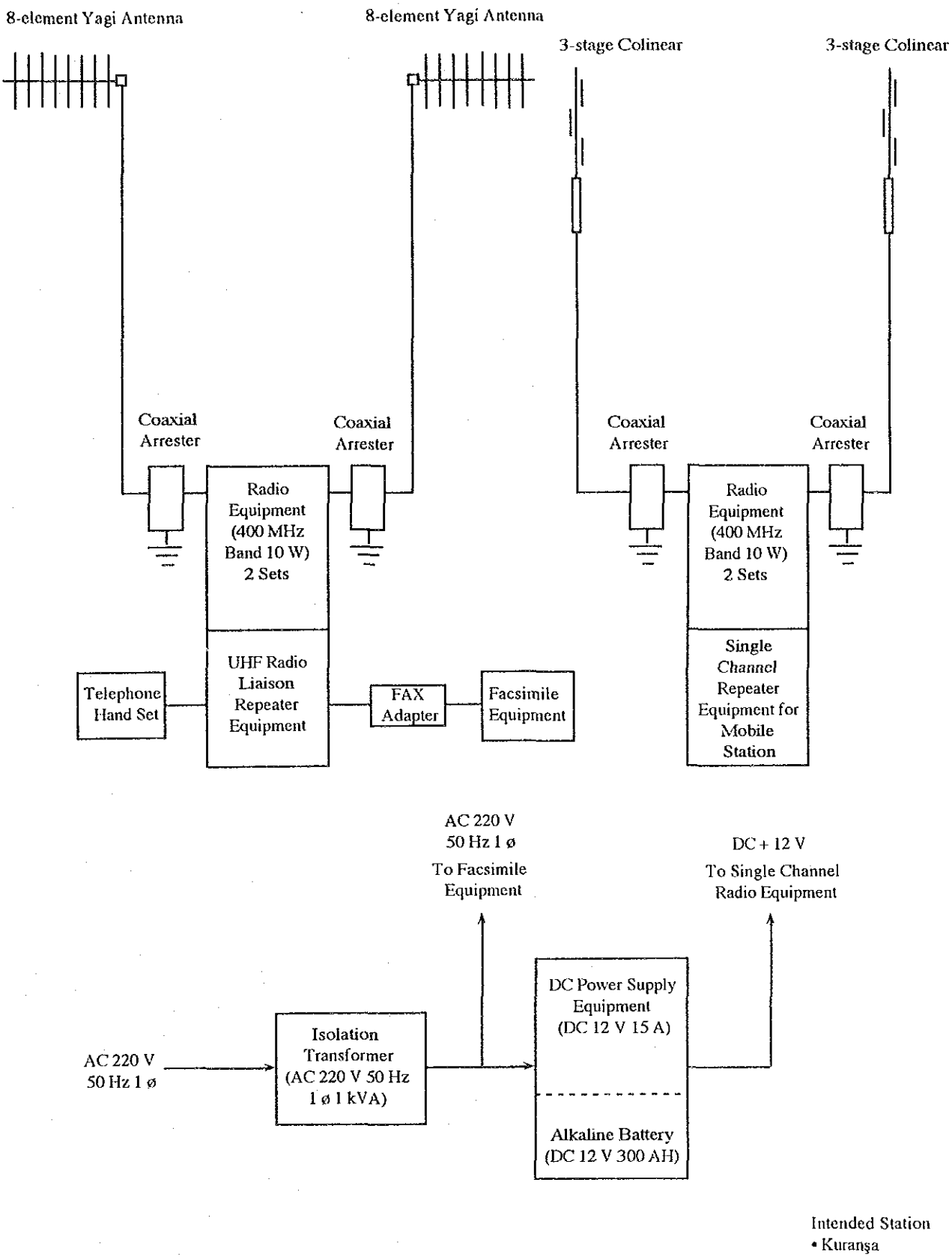
FIG.NO.



Intended Stations
- Doğankent ASO Office
- Yenice ASO Office

THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	**FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.16 EQUIPMENT COMPOSITION OF ASO UHF RADIO LIAISON STATION

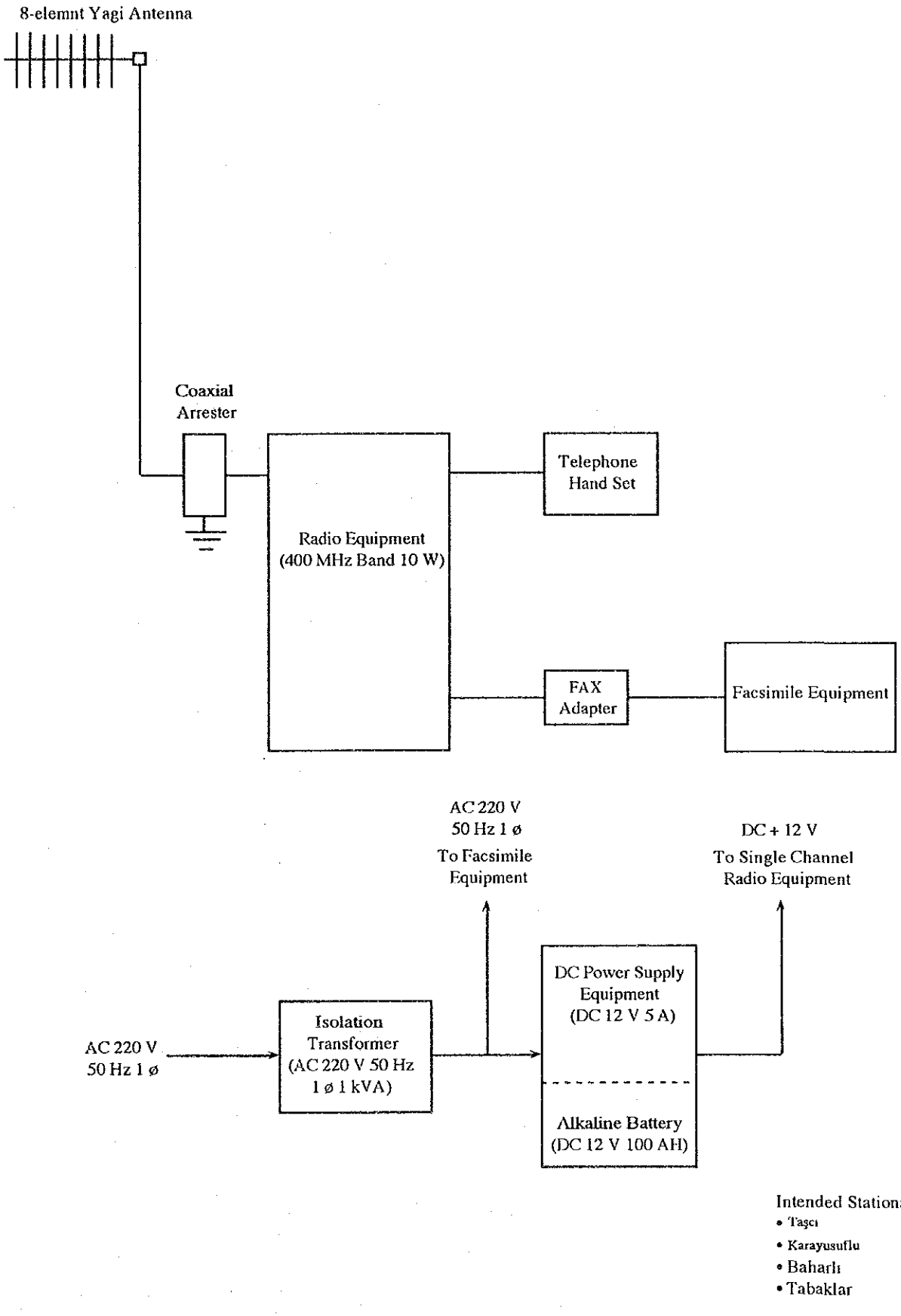
FIG.NO.



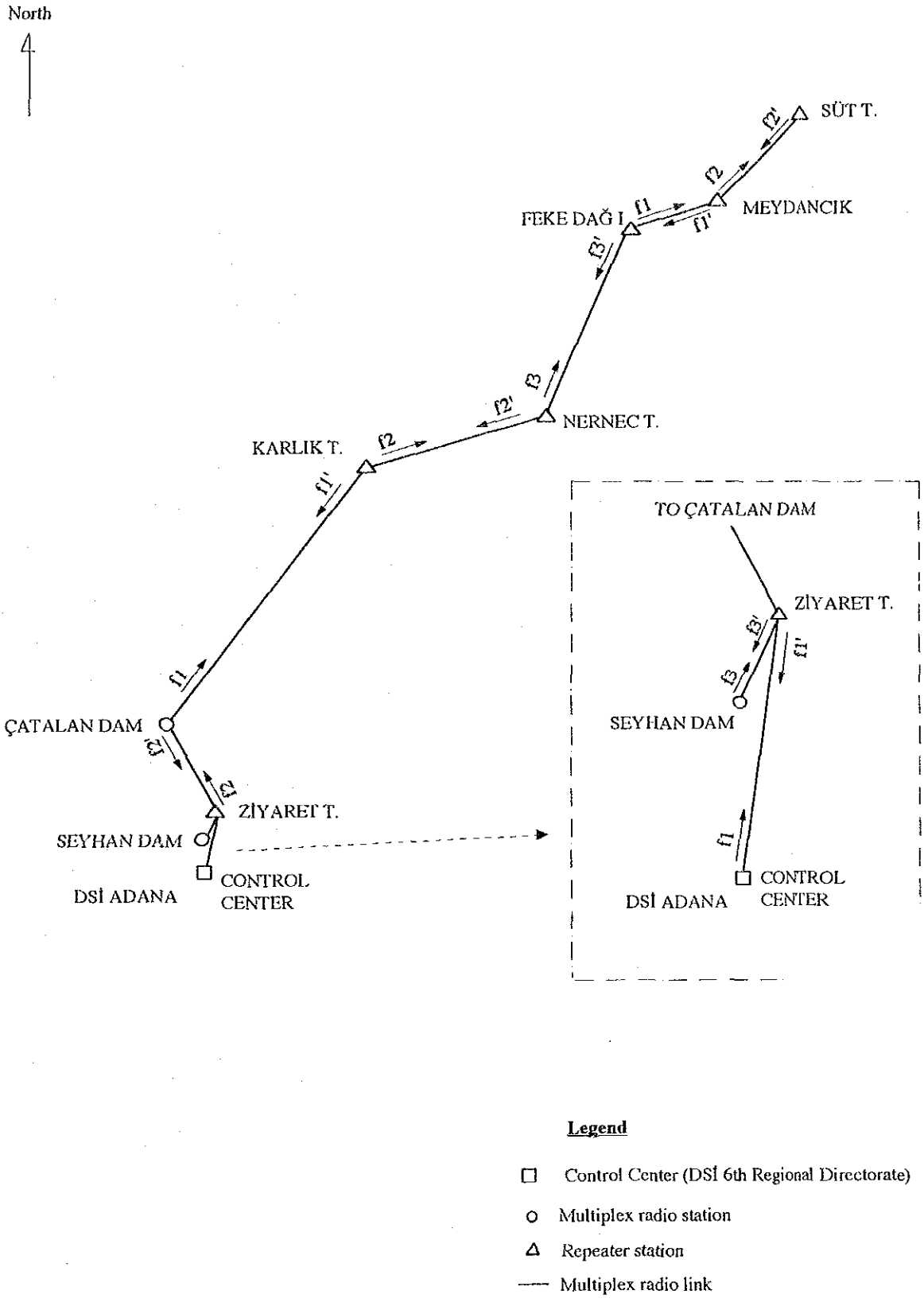
Intended Station
• Kuranşa

THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	***FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN*** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.17 EQUIPMENT COMPOSITION OF UHF RADIO LIAISON REPEATER STATION

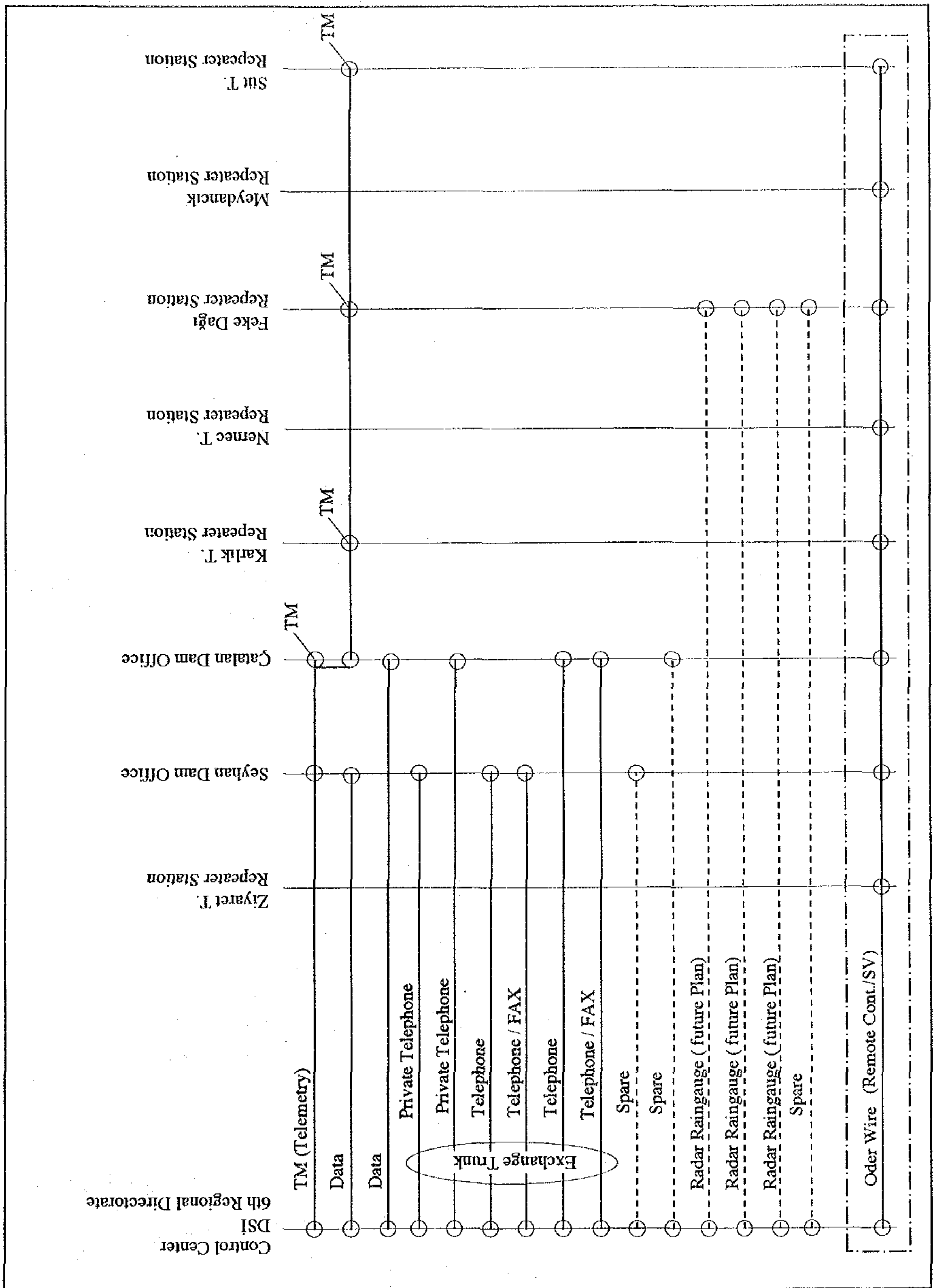
FIG.NO.



THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	**FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN** JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.1.18 EQUIPMENT COMPOSITION OF TOWNS/VILLAGES HEAD'S OFFICE UHF RADIO LIAISON STATION



THE REPUBULIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.3.1 RADIO FREQUENCY ASSIGNMENT PLAN OF MULTIPLEX RADIO LINK



THE REPUBLIC OF TURKEY DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜ	FLOOD CONTROL, FORECASTING AND WARNING SYSTEM FOR SEYHAN RIVER BASIN JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Figure 2.3.2 CHANNEL PLAN OF MULTIPLEX RADIO COMMUNICATION NETWORK