

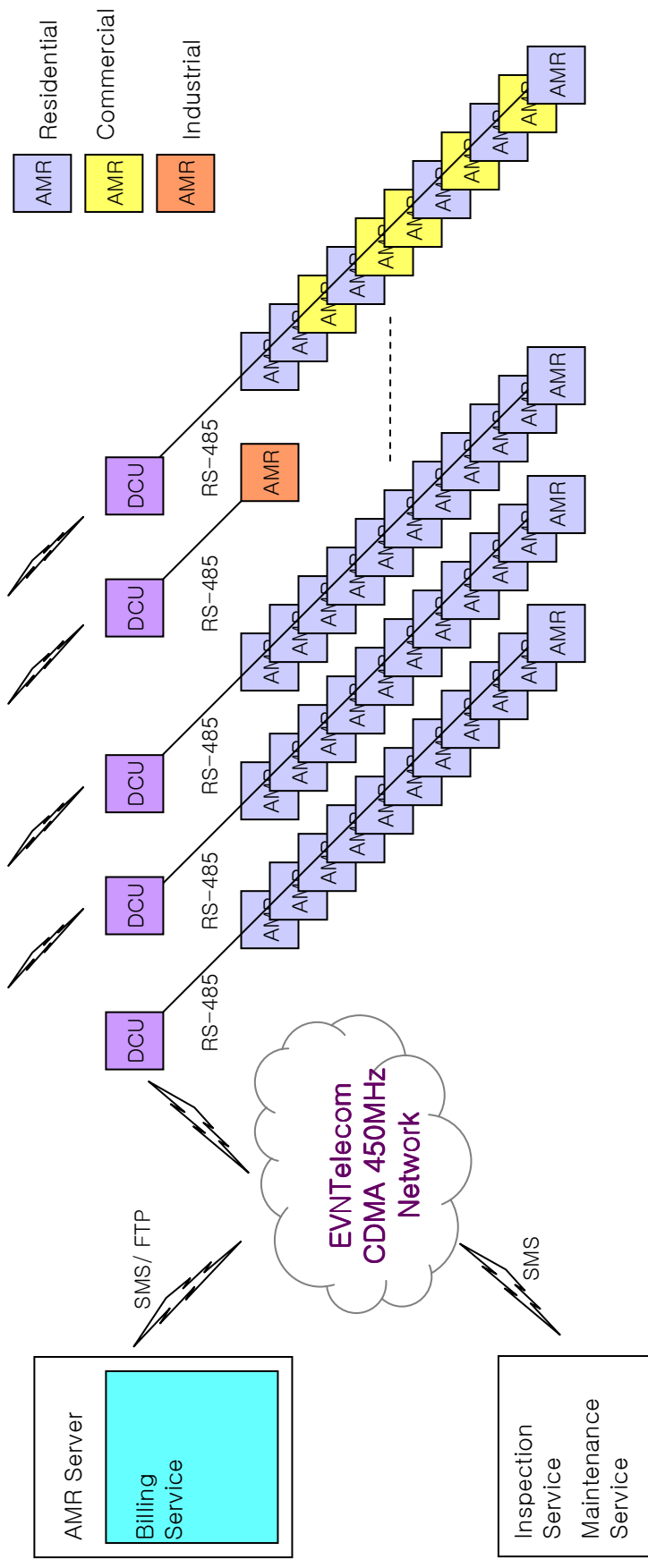
Automatic Meter Reading System Proposal for EVN SPC

Feb. 14, 2011

Supplier : HPI

Manufacturer: OMNI System

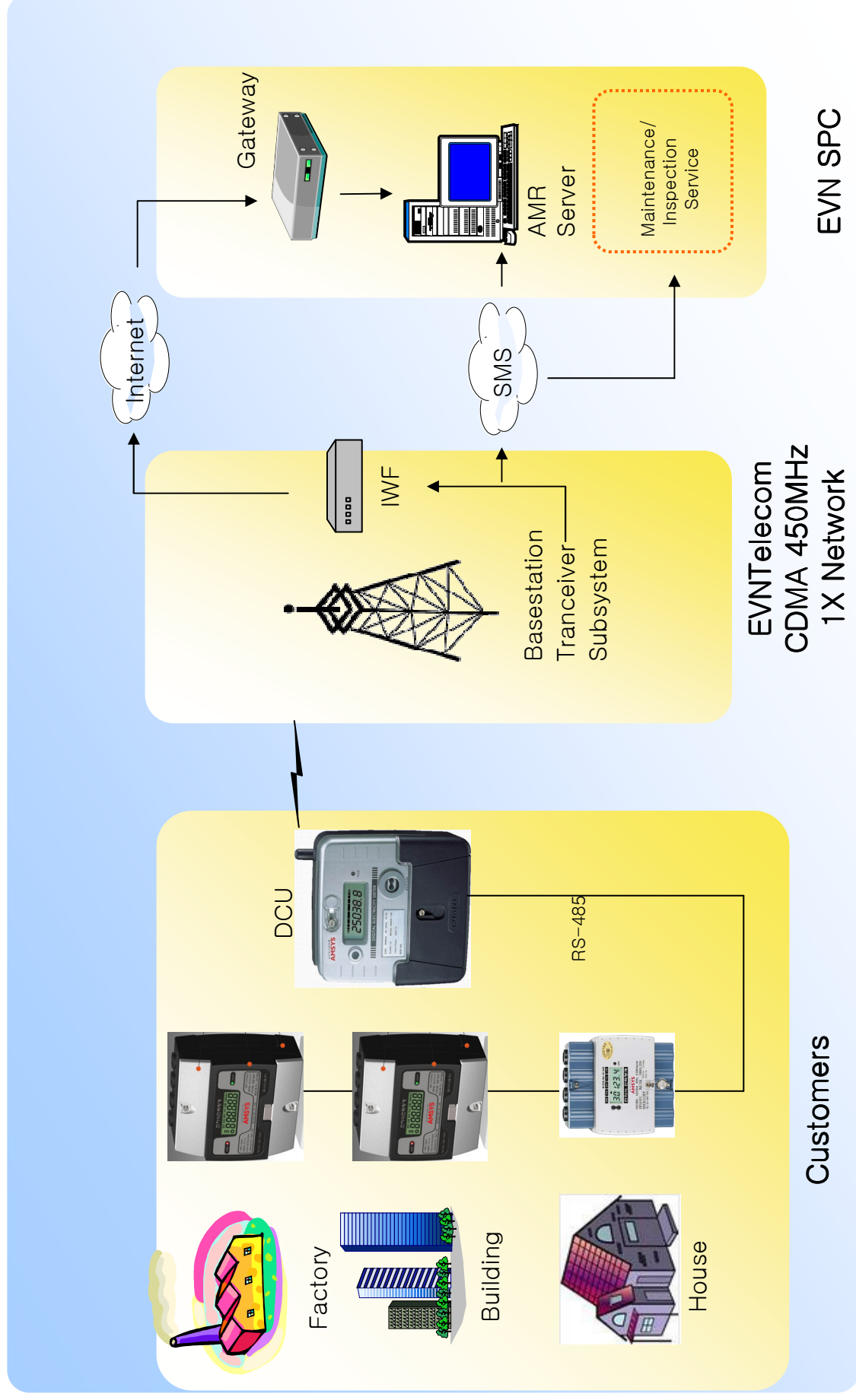
▷ Introduction



Automatic meter reading (AMR) is the technology of automatically collecting data from energy meters and transferring that data to a server for analysis and/or billing.

The communication between EVN SPC and the remote meters is established through our CDMA 450MHz 1X technology based telemetry system, which supports a feasible, yet cost effective approach, which is both reliable and effective.

▷ ► System Configuration

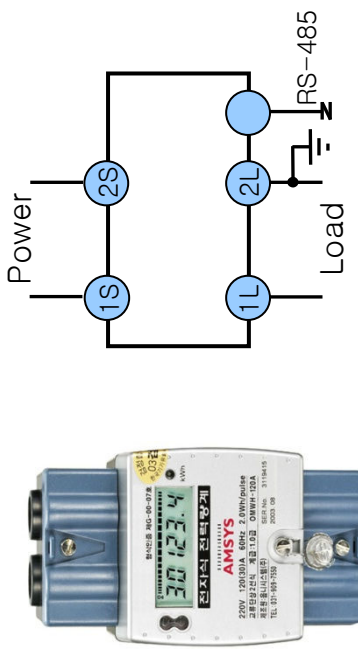


Smart Meter

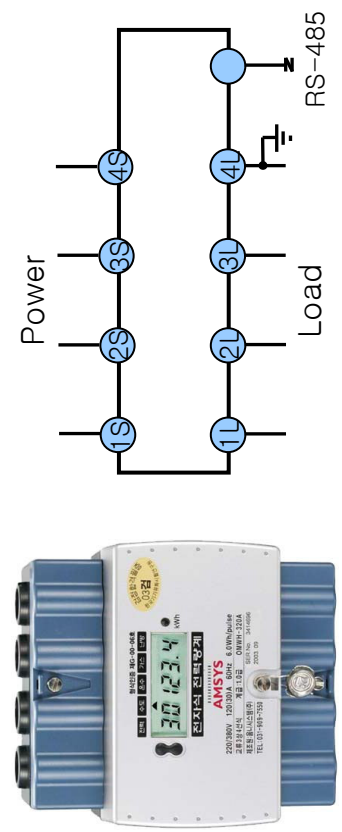
Item	Single phase OMMH-120P	Three phase OMMH-340P
Phase & Wire	1P 2W	3P 4W
Connection	Top & bottom	Top & bottom
Input voltage	AC 220V	AC 220/380V
Current	120(30)A	120(30)A
Frequency (Hz)	50/60Hz	50/60Hz
Class	1	1
Constant	500 (pulse/kWh)	500 (pulse/kWh)
Consumption	1.8W Bellow	1.8W Bellow
Current Detection	CT	CT
Channel	Import/Export/Active power/Reactive power/Power factor	Import/Export/Active power/Reactive power/Power factor
LCD Type	STN	STN
Counter	5+1 or 4+2	5+1 or 4+2
Cover Material	Polycarbonate	Polycarbonate
Size(mm)	70W X 131H X 54D	147Wx114Hx64D

▶▶ Low-end Digital Meters

Single phase Two Wire Multi Tariff



Three Phase Four Wire



TYPE	Single Phase Two Wire- OMWH-12		
WIRING	Horizontal / Vertical		
RATE	220V 50, 60Hz 10(40) A		
SIZE	66(W) X 131(H) X 53(D) mm		
LCD SIZE	40 X 15 (Digit Size 7 X 4) mm , 5+1 digits		
FUNCTION	Class	: 1.0	
	Operating Temperature	: -20℃ ~ 60℃	
	Humidity	: 98%	
	Power consumption	: less than 1.5W	
	Communication Method	: RS-485	
	Applied standard	: KSC-0704, KSC-0225, KSC-0221, KSC-	
	00240.	IEC 62053-21, IEC	
62052-11		Measuring parameter : kWh	

TYPE	Three Phase Four Wire- OMWH-34		
WIRING	Horizontal / Vertical		
RATE	220/380V or 110/190V 50, 60Hz 10(40) A :		
SIZE	114(W) X 131(H) X 53(D) mm		
LCD SIZE	40 X 15 (Digit Size 7 X 4) mm , 5+1 digits		
FUNCTION	Class	: 1.0	
	Operating Temperature	: -20℃ ~ 60℃	
	Humidity	: 98%	
	Power consumption	: less than 1.5W	
	Communication Method	: RS-485	
	Applied standard	: KSC-0704, KSC-0225, KSC-0221, KSC-	
	00240	IEC 62053-21, IEC	
62052-11		Measuring parameter : kWh	

▷ ► Master DCU– CDMA 450MHz Communication Unit

Reading meters

- Read monthly accumulated electrical usage (KWh) of meters
- Read up to 64 meters/ Slave DCUs
- Slave DCU can read up to 128 meters
- Support EVN SPC customer ID for the naming of each meter
- Support dual tariffs- enable all meters to support dual tariffs
- **Data communication**
 - TCP/IP Packet data transfer
 - SMS
- **Remote control by AMR Server**
 - Automatic meter data transfer to AMR server by either FTP or SMS
 - Remote setup DCU parameters for automatic data transfer such as Reading Time, Sending Time,

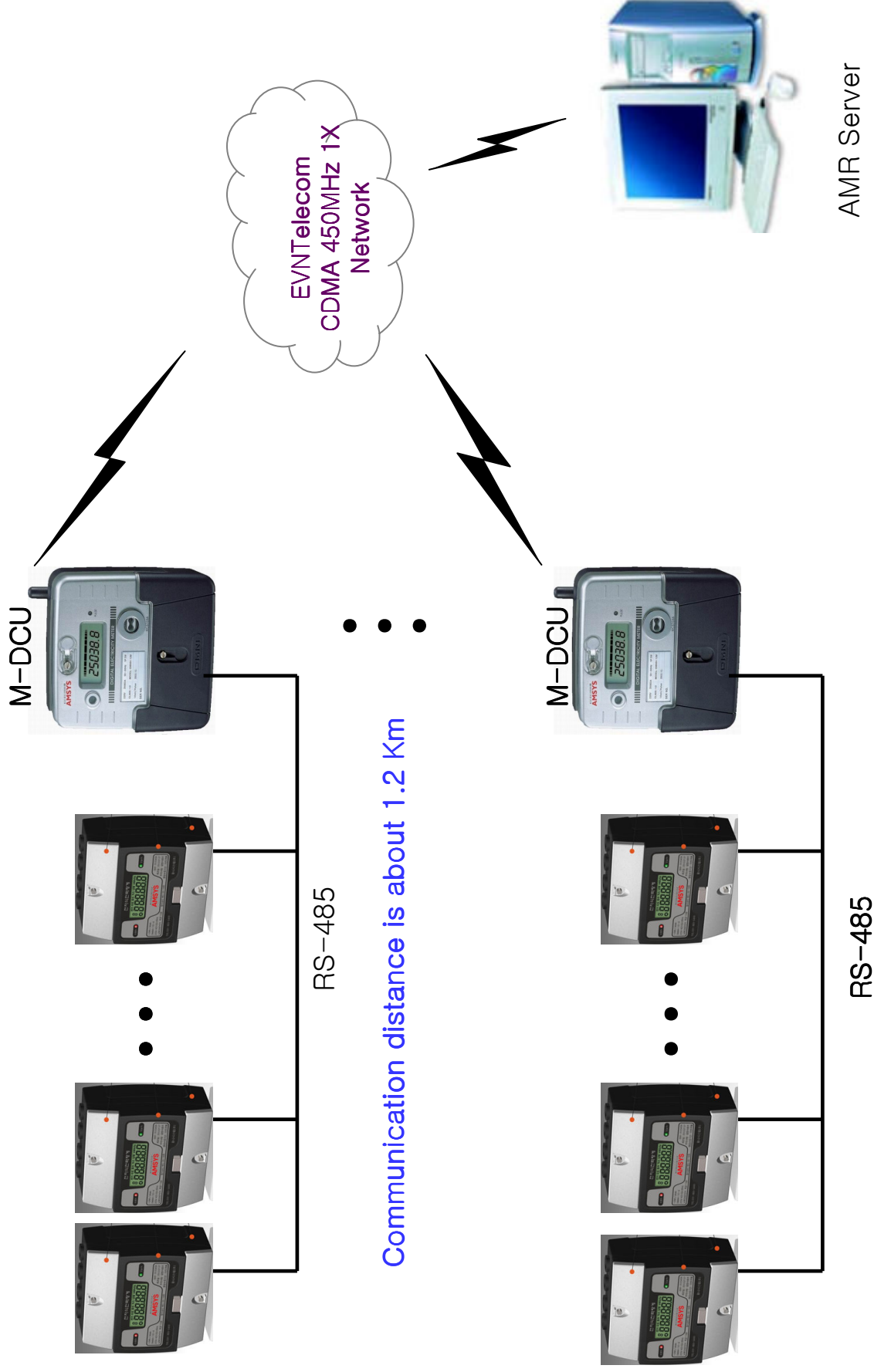
• Self Diagnosis and Warning

- Weak RF signal
- Low battery
- Communication Problem between DCU and specific meters
- Daily Diagnosis SMS report
- Real Time Power-cut notice

• Remote reading meters by inspector

- Remote manual meter reading via SMS
- **Remote maintenance**
 - SMS based Diagnosis by maintenance persons
 - Set up DCU parameters for maintenance

►► AMR System Configuration using Master DCUs



➤ ➤ Slave/ Master DCU (Distributor Control Unit)

Slave Distributor Control Unit (S-DCU)



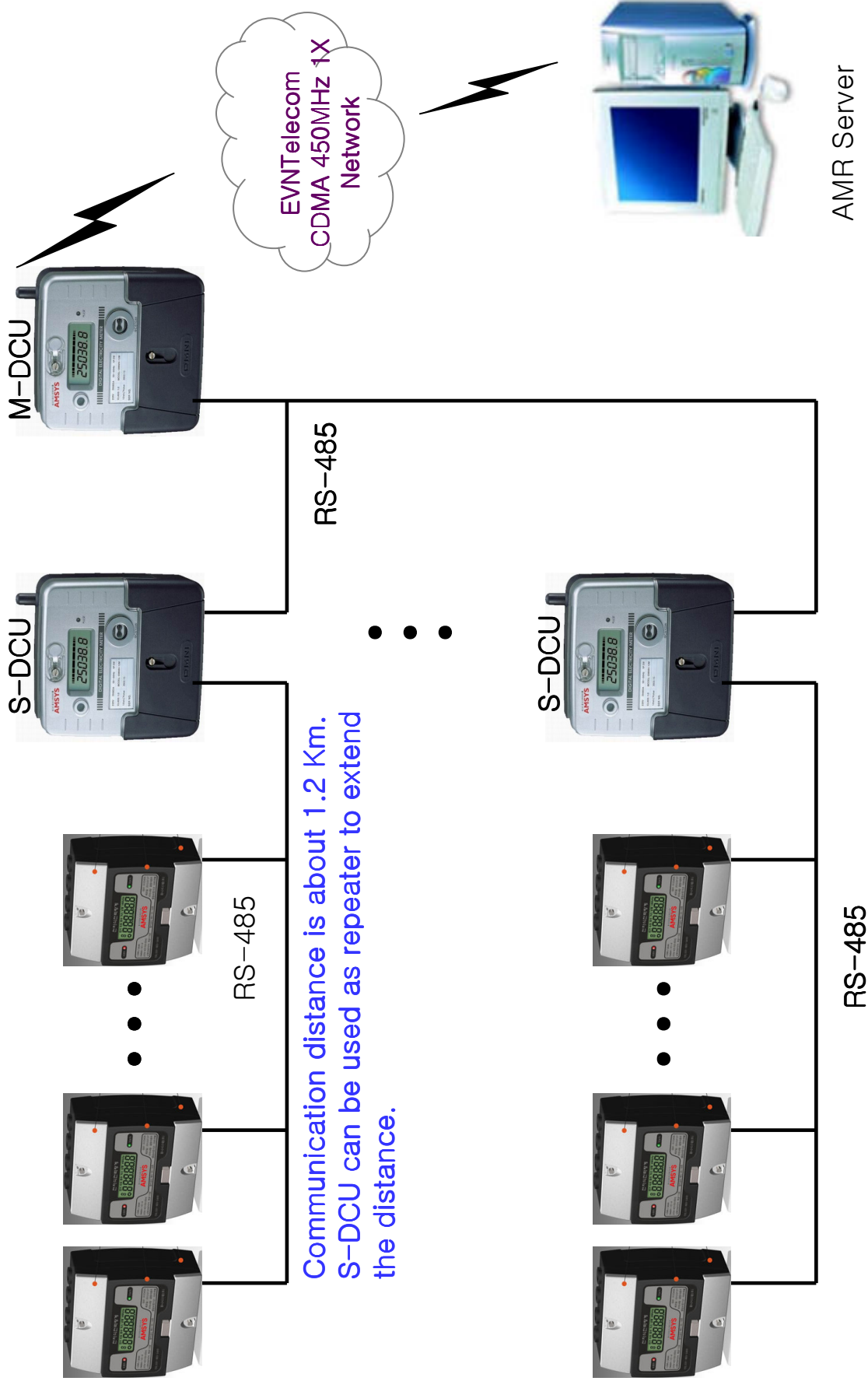
Model	S-DCU
Input Voltage	AC 220V
Wiring	Single Twisted Pair(2Lines)
Transmission Speed	1200 bps
Communication System	RS-485
The Number of Meters Per S-DCU	MAX 128 EA
Size	140(W) X 125(H) X 48((D)
Function	As the distributor control unit for telemetering, one S-DCU can be connected with digital electricity meters. It can be also used for RS-485.

Master Distributor Control Unit (M-DCU)



Model	M-DCU
Input Voltage	AC 220V
Wiring	Single Twisted Pair (2Lines)
Transmission Speed	1200 / 9600 bps
Communication System	RS-485, CDMA 450MHz 1X
The Number of Meters Per M-DCU	MAX 64 EA
Size	140(W) X 125(H) X 48((D)
Function	Master DCU will be connected to either S-DCUs or digital electricity meters. CDMA 450MHz 1X communication is made through internal RS-232C interface.

►► AMR System Configuration using Master and Slave DCUs



▷ ▶ AMR Server Construction Proposal

▶ **STAGE I (2nd Generation Meter Reading)**

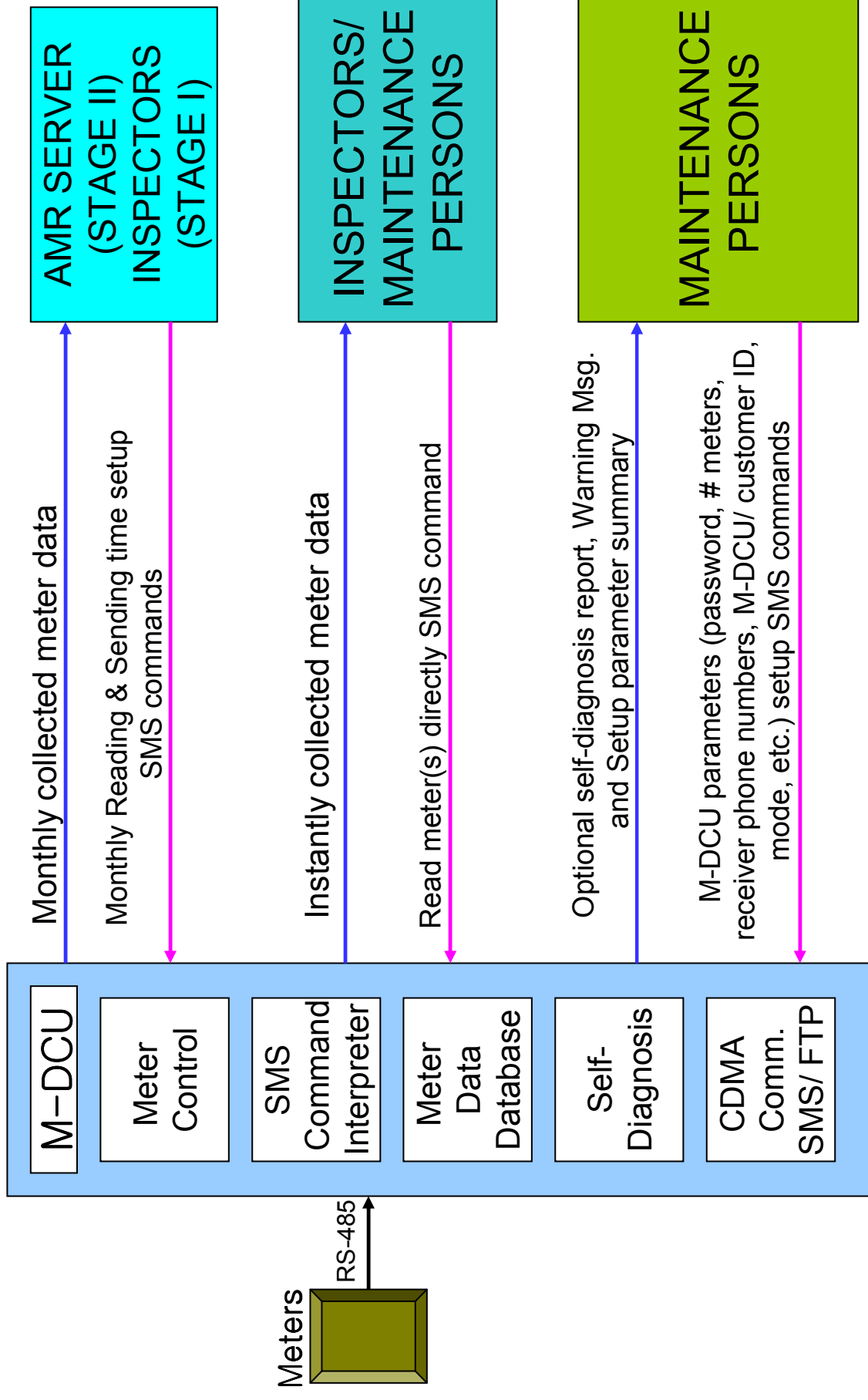
Inspectors read electricity meters by using CDMA 40MHz 1X SMS based telemetering system until EVN SPC constructs an AMR Server which is interoperatable with existing billing system.

▶ **STAGE II (3rd Generation Meter Reading)**

Once EVN SPC constructs an AMR Server which operates with existing billing system, the server reads all the meters and issues bills to all the customers automatically.

► Master DCU– CDMA 450MHz Communication Unit (Patent)

► SMS Message Flow



▷ ► Master DCU– CDMA 450MHz Communication Unit

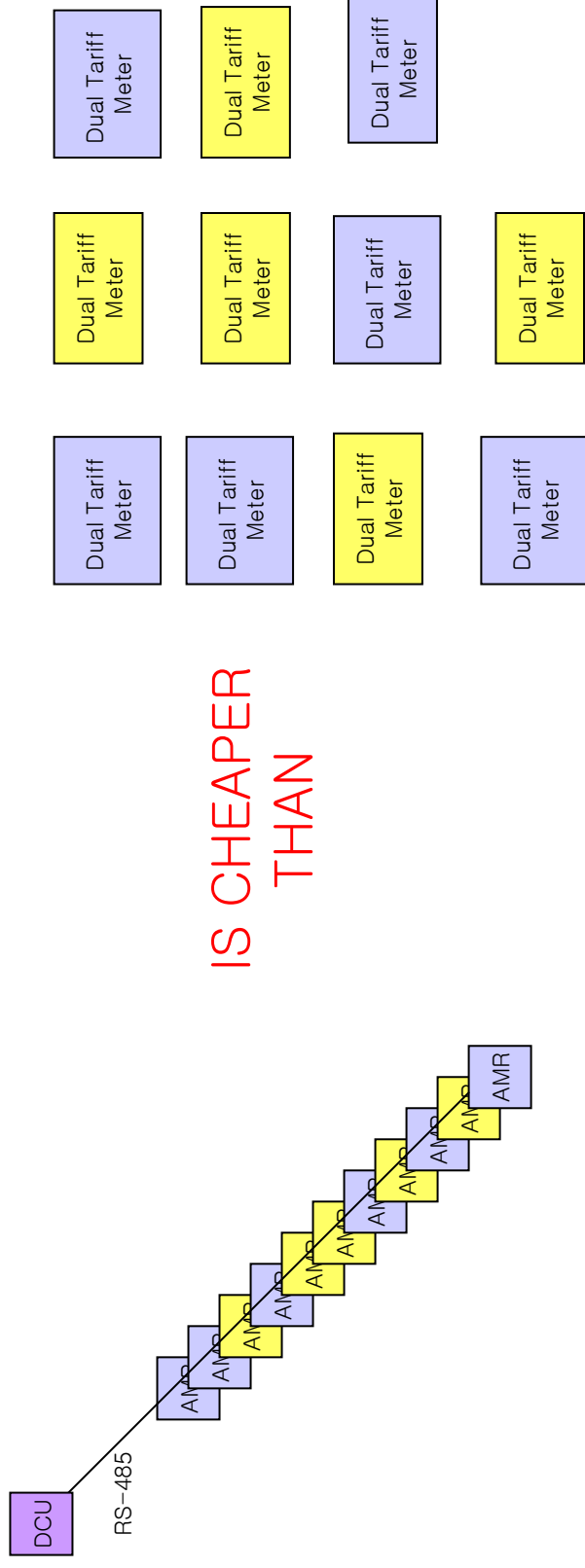
► Support both 2nd and 3rd generation meter reading

Gen.	Place	Description	M-DCU
1st	Meter	<ul style="list-style-type: none">- Visit customer, read meter and then record the data- In case no customer at home (meter is installed inside home), inspector has to come back later- In case of no reading meter, apply mean value for bill	
2nd	short distance	<ul style="list-style-type: none">- Read meter and then record the data at short distance- Due to short distance limitation, inspector has to move all the customer places.- Reading times are not the same for all customers	Any distance OK No need to move Same reading time
3rd	Power Company	<ul style="list-style-type: none">- Automatic meter reading- Automation of reading and collection- Real time analysis, statistics and billing	Support

NOTE: M-DCU allows for smooth transition from 2nd generation to 3rd generation meter reading by adding AMR Server to EVN SPC

➤ Master DCU– CDMA 450MHz Communication Unit

- M-DCU provides for cheap dual tariff metering solution



NOTE: M-DCU converts mono tariff meters to dual tariff meters

▶ Master DCU– CDMA 450MHz Communication Unit

▶ MONTHLY COLLECTED METER SMS DATA

Classification	SMS Message	# characters
M-DCU ID	9 digits <RET>	10
No. of Meters (Max 8192)	4 digits <RET>	5
Meter ID	4 digits <RET>	5
Customer ID	11 digits<RET>	12
Collected Meter Data:		
Present Month (KWh)	xxxxx.x<RET>	8
Previous Month (KWh)	xxxxx.x<RET>	8
Collected Tariff Meter Data (OPTION):		
Present Month Used Energy (KWh)	xxxxx.x<RET>	8
Reading Time	yymmddhhmm	10
TOTAL		66

▶ Master DCU– CDMA 450MHz Communication Unit

▶ MONTHLY COLLECTED METER PACKET DATA

Classification	Packet data	# Bytes
M-DCU ID	9 digits *	5
No. of Meters (Max 8192)	4 digits *	3
Meter ID	4 digits *	3
Customer ID	11 digits *	6
Collected Meter Data:		
Present Month (100Wh)	6 digits *	4
Previous Month (100Wh)	6 digits *	4
Collected Tariff Meter Data (OPTION):		
Present Month Used Energy (100Wh)	6 digits *	4
Reading Time	10 digits *	6
CRC-16 - 1001.0000.0010.0001	16 bits	2
Terminator - CR, LF	2 characters	2
Total		39

▷ ► Master DCU– CDMA 450MHz Communication Unit

► SMS COMMANDS– 16 Commands

MEANING	SMS COMMAND
Change Password	#CP/<old_password>/<new_password>/<new_password>
Set Server IP address	#SI/<Password>/<IP_address>
Set Server Phone #	#SP/<Password>/<Phone_Number>
Set Maintenance Phone #	#MP/<Password>/<Phone_Number>
Set M-DCU ID	#DI/<Password>/<M-DCU_ID>
Set Number of Meters	#NM/<Password>/dddd
Set Customer ID	#CI/<Password>/<Meter_ID-List>/<Customer_ID_List>
Change Mode-OPTION	#CM/<Password>/a, (Non-tariff mode(0), Tariff mode(1))
Set Peak Time period-OPTION	#PT/<Password>/hhmm/hhmm/mmdd/mmdd
Activate/ Deactivate M-DCU	#AD/<Password>/<Password> / #DD/<Password>/<Password>
Set Daily Test Report	#TR/<Password>/a (No report(0), Daily report(1))
Read Meter(s) Directly	#RD/Password/<Meter_ID> or ALL
Set Monthly Reading/ Sending Time	#RT/<Password>/ddhhmm / #ST/<Password>/ddhhmm
Show M-DCU Setup parameters	#SS/<Password>

▷ ► Master DCU– CDMA 450MHz Communication Unit

► SMS COMMAND PROGRAM EXAMPLE– INSTALLATION

SMS CMD Program#1	Description
#CP/00000000/12345678/12345678	Initially, password is “00000000”. Now, new password become “12345678”
#SP//0963007777	AMR Server Phone # becomes “0963007777”
#MP//0962907777	Maintenance Phone # becomes “0962907777”
#DI//00012345	M-DCU ID becomes “00012345”
#NM//4	No. of meters connected to M-DCU is 4
SMS CMD Program#2	NOTE: “/Password/” can be used as “//” if used before
#CI/12345678/0-1/000000021, 00000022	Customer IDs of Meter#0 and Meter#1 become 00000021 and 00000022, respectively.
#CI//2-3/000000023,000000024	Customer IDs of Meter#2 and Meter#3 become 00000021 and 00000022, respectively.
SMS CMD Program#3	
#RT/12345678/250400	M-DCU collects meter data at 04:00 of every 25 th day
#ST//26/0830	M-DCU sends meter data to AMR server at 08:30 of 26 th
#AD//12345678	M-DCU is working for automatic meter reading mode

▷ ► Master DCU– CDMA 450MHz Communication Unit

► SMS COMMAND PROGRAM EXAMPLE– Maintenance and inspection persons

SMS CMD Program#4	Description
#TR/12345678/1	Test report SMS Msg. is sent to maintenance person every day
#DD//12345678	M-DCU becomes manual meter data collection mode (Default)
#RD//All	M-DCU send the present data of all meters to maintenance
#SS//	M-DCU sends the present setup parameters to Maintenance
#AD//12345678	The latest collected meter data becomes Previous Month data and then becoming automatic meter reading mode
#CM//1	M-DCU becomes Tariff mode (OPTION)
#PT//1100/1800/0301/1231	Peak time period is 11:00-18:00 starting Mar. 1 st till Dec. 31 st

- M-DCU Default values:

Password: 00000000, Manual meter data collection mode, non-Tariff mode and

Daily Test Mode “Off”.

- When AMR system is installed, both manual inspection and billing need to be made for several months and therefore the most recently collected meter data sent by “#RD//ALL” must become Previous Month meter data after the processing of #AD command (entering automatic meter data collection mode), as the data were used for Previous Month billing manually.