

AN8019K, AN8019S

DC-DC Converter IC Incorporated Transmitting/Receiving Circuit for HBS

Overview

The AN8019K/S incorporates the transmitting/receiving circuit complying with the HBS standards.

Since the highly precise DC-DC converter is built in it, the unstable power supply in the bus line can be easily stabilized. Also, it incorporates the reset output circuit, which generates the system reset signal.

It is suitable for the interface unit with bus line of the wide range of equipment such as that related to telephone, air conditioner or home security.

Features

[DC-DC block]

- Highly-precise output voltage ($5V \pm 5\%$)
- Built-in error amplifier for overcurrent detection
- Circuit preventing malfunction at low input
- Dead time control/Soft start

[Reset output block]

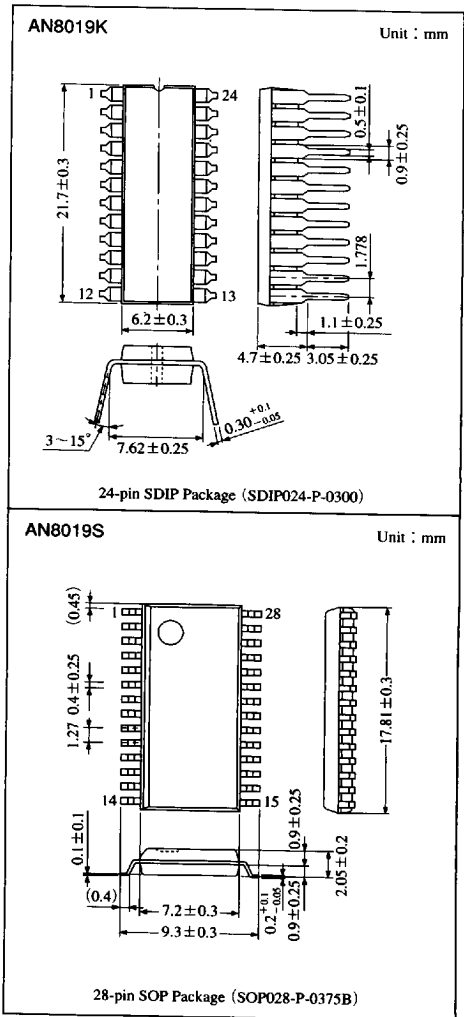
- Detection voltage ($4.2 \pm 0.25V$)
- Hysteresis width (200mV typ.)

[AMI transmitting/receiving block]

- Complying with HBS standards
- Twist pair, co-axial switching allowed

[Others]

- Package of DIL/SO type available

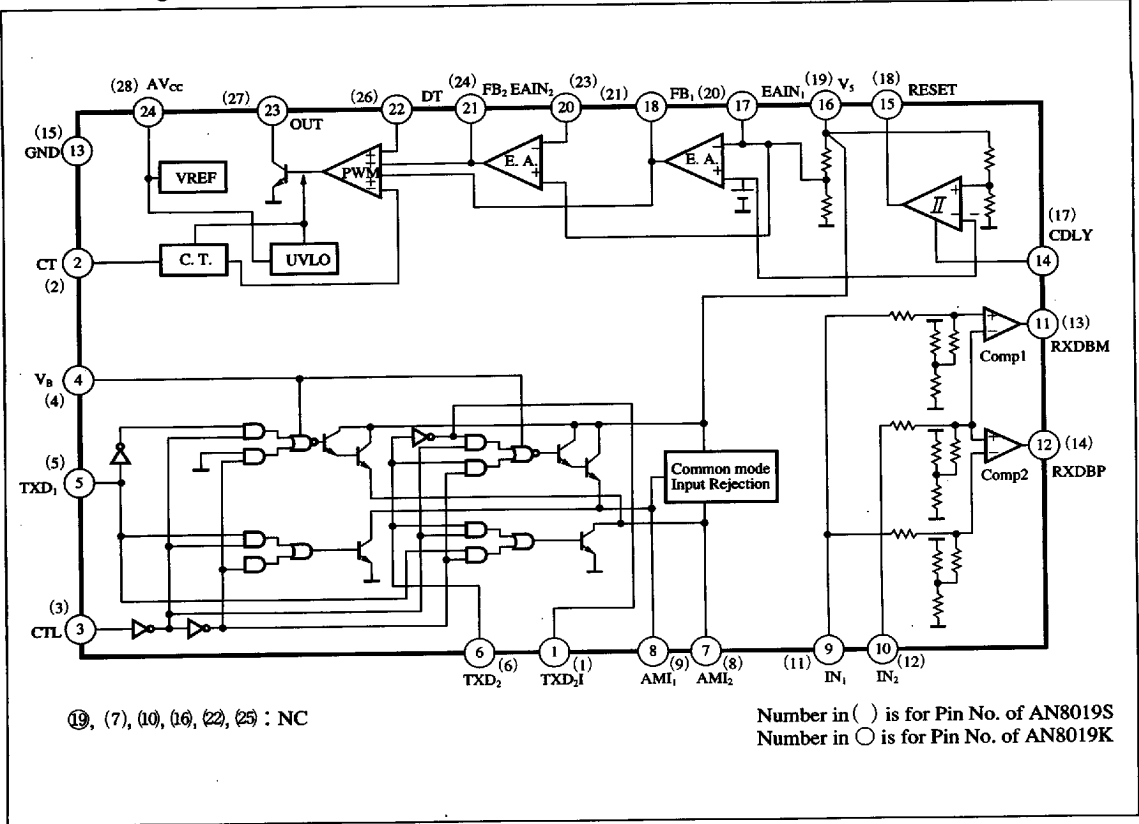


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■ Block Diagram



■ Absolute Maximum Ratings (Ta=25°C)

Parameter		Symbol	Rating	Unit
Supply voltage		AV _{cc} /V _s	36/6	V
Supply current		I _{cc} /I _s	20/100	mA
Power dissipation	AN8019K	P _D	600	mW
	AN8019S		532	mW
Operating ambient temperature		T _{opr}	-20 to +75	°C
Storage temperature		T _{stg}	-55 to +150	°C

* The power dissipation specified for the AN8019S is a value when the IC is mounted on the glass epoxy board (50×50×0.8mm).

■ Recommended Operating Range (Ta=25°C)

Parameter	Symbol	Range
Operating supply voltage	AV _{cc}	10V to 35.5V
Operating supply voltage	V _s	4.5V to 5.5V

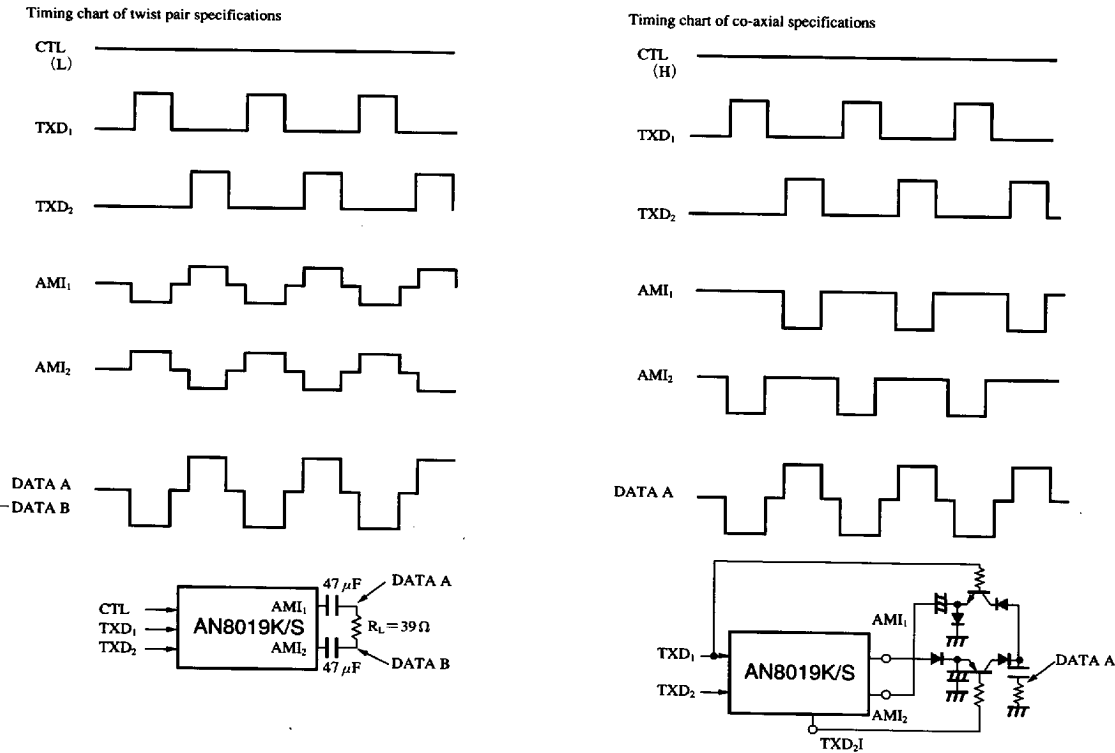
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■ Electrical Characteristics (V_{CC}=20V, Ta=25°C)

Parameter	Symbol	Condition	min	typ	max	Unit
Output voltage	V _O		4.75	5	5.25	V
Triangular oscillation frequency	f _{OSC}	CT=330pF	60	80	100	kHz
Maximum duty ratio	Γ _{max}	CT=330pF	85	—	—	%
PWM output voltage	V _{OUT}	I _O =30mA	—	—	1.2	V
Reset threshold voltage	V _{SEN}		3.95	4.2	4.45	V
Reset hysteresis voltage	ΔV _{SEN}		100	200	300	mV
Reset output voltage	V _{RESET}	I _{RESET} =1mA	—	—	0.5	V
AMI output voltage L	V _{OL}	R _L =39Ω, V _B =5V	—	—	0.5	V
AMI output voltage H	V _{OH}	R _L =39Ω, V _B =5V	2.5	—	—	V
OFF output impedance	Z _{OUT}		40	60	—	kΩ
Reception sensitivity of receiving block	V _{RS}		0.6	1	1.4	V
OFF input impedance	Z _{IN}		33	50	—	kΩ
Delay time for transmission/reception	T _{diy}		—	1	2	μs

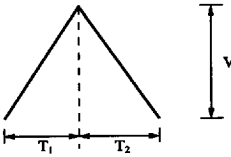
■ Timing Chart



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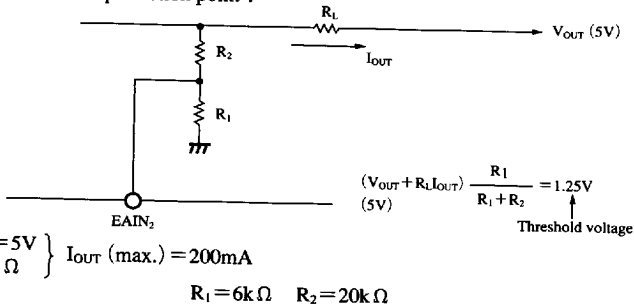
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Pin Descriptions

Pin No.	Symbol	Terminal description
1 (1)	TXD ₂ I	• Terminal outputting the reverse signal of the microcomputer-transmission output signal (TXD ₂). The application of co-axial cables only used (Open for AMI)
2 (2)	CT	• Triangular oscillation capacitor terminal  $T_1 = \frac{CV}{I_c \text{ (Charging current)}} \quad T_2 = \frac{CV}{I_d \text{ (Discharging current)}}$ Oscillation frequency $f = \frac{1}{T_1 + T_2} = \frac{I_c \cdot I_d}{CV(I_c + I_d)} \text{ (Hz)}$ Normally, $\left. \begin{array}{l} V = 0.63V \\ I_c = 35 \mu A \\ I_d = 32 \mu A \end{array} \right\} \text{ When } C = 330pF, f = 80kHz$
3 (3)	CTL	• Control (twist pair, co-axial switching) terminal "L" for twist pair, "H" for co-axial switching
4 (4)	V _B	• Bias terminal (For amplification of AMI amplitude) • By applying V _B = 7V, AMI amplitude of 3.5V (R _L = 100Ω) is realized. <HBS standards : 2.5V (R _L = 39Ω) > • V _B and V ₅ are shorted when it is used under the ordinal HBS standards.
5 (5)	TXD ₁	• Microcomputer-transmitted signal inputting terminal Terminal inputting the signal transmitted from microcomputer
6 (6)	TXD ₂	
7 (8)	AMI ₂	• *AMI signal output terminal : Terminal outputting the AMI signal to bus line
8 (9)	AMI ₁	
9 (11)	IN ₁	• Reception comparator inputting terminal Terminal inputting the signal from bus line
10 (12)	IN ₂	
11 (13)	RXDBM	• Reception comparator output terminal Terminal transmitting the output of reception comparator to microcomputer
12 (14)	RXDBP	
13 (15)	GND	• Ground terminal
14 (17)	CDLY	• Capacitance terminal for reset delay The capacitive connector terminal inserts the delay time (T _d) since the reset signal is outputted after the microcomputer system is stabilized. $T_d = \frac{CV}{I_c \text{ (Charging current)}} \text{ [ms]}$ Normally, $\left. \begin{array}{l} V = 0.7V \\ I_c = 7 \mu A \end{array} \right\} \text{ When } C = 0.1 \mu F, T_d = 10ms$
15 (18)	RESET	• Reset signal outputting terminal It outputs the following signal to microcomputer : "H" when V ₅ is 4.2V or more, and "L" when V ₅ is 4.0V or less. Hysteresis width : 0.2V, Open collector output type
16 (19)	V ₅	• 5V inputting terminal The supply voltage input of AMI transmission/reception circuit block (4.5 to 5.5V) It uses the output of DC-DC converter (5 ± 0.25V) or external power supply. At the same time, it also functions as the reset detection input terminal of the microcomputer reset circuit.
17 (20)	EAIN ₁	• Input terminal of error amplifier Threshold voltage : 1.25V
18 (21)	FB ₁	• Output terminal of error amplifier
19 (7) (10) (16) (22) (25)	NC	

Number in () is a pin number for the AN8019S (Surface-mount type)
*AMI Digital signal transmission waveform with three values of zero, plus and minus

Pin Descriptions (cont.)

Pin No.	Symbol	Terminal description
20 (23)	EAIN ₂	- Input terminal of error amplifier for overcurrent detection - Setting the overcurrent protection point : 
21 (24)	FB ₂	Output terminal of error amplifier for overcurrent detection
22 (26)	DT	- Dead time control terminal - It sets the maximum duty ratio to 90% (typ.). - By the external capacitance the soft start of SW power supply block can be realized.
23 (27)	OUT	- Switching output terminal - Output current I_{OUT} = 30mA (max.)
24 (28)	AV _{CC}	- Supply voltage input voltage - Operating supply voltage range: 10 to 35.5V

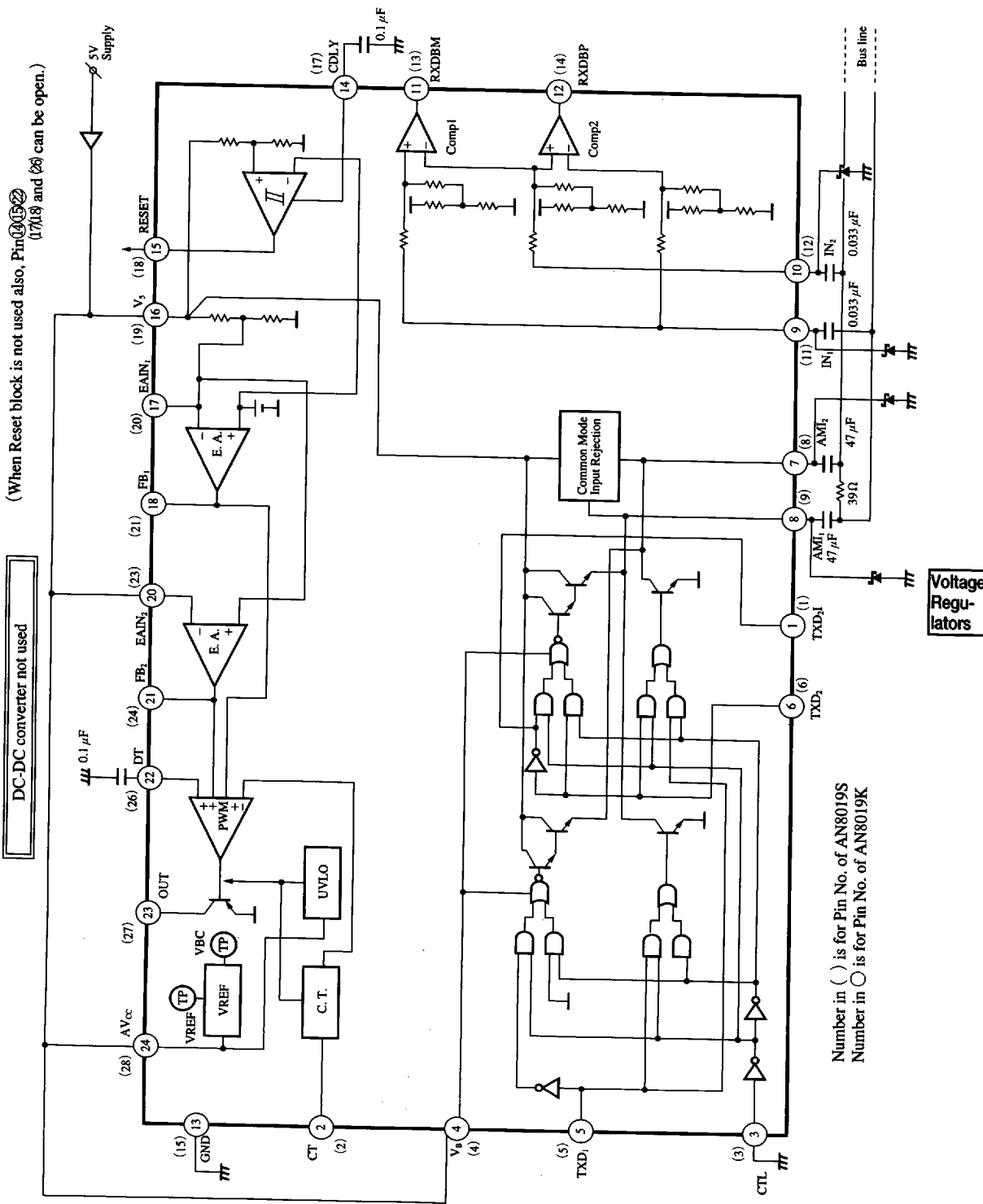
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Application Circuit 2
(Twist pair specifications)

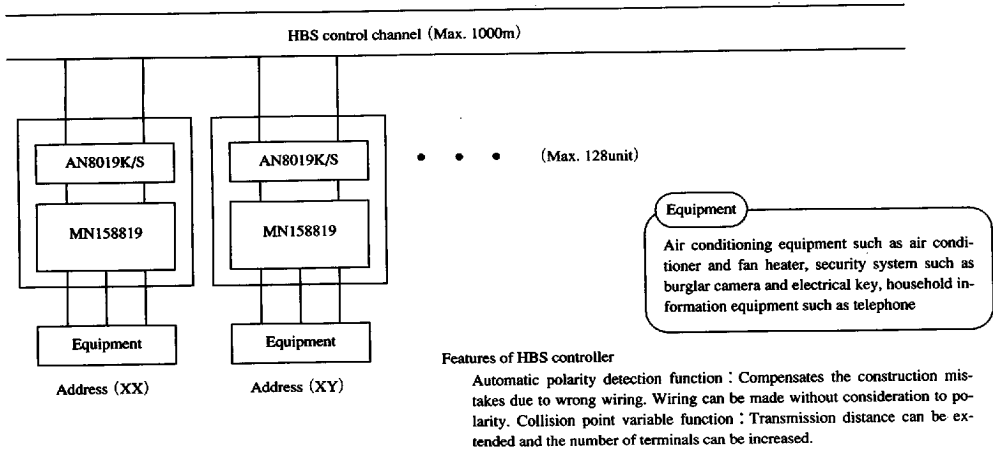


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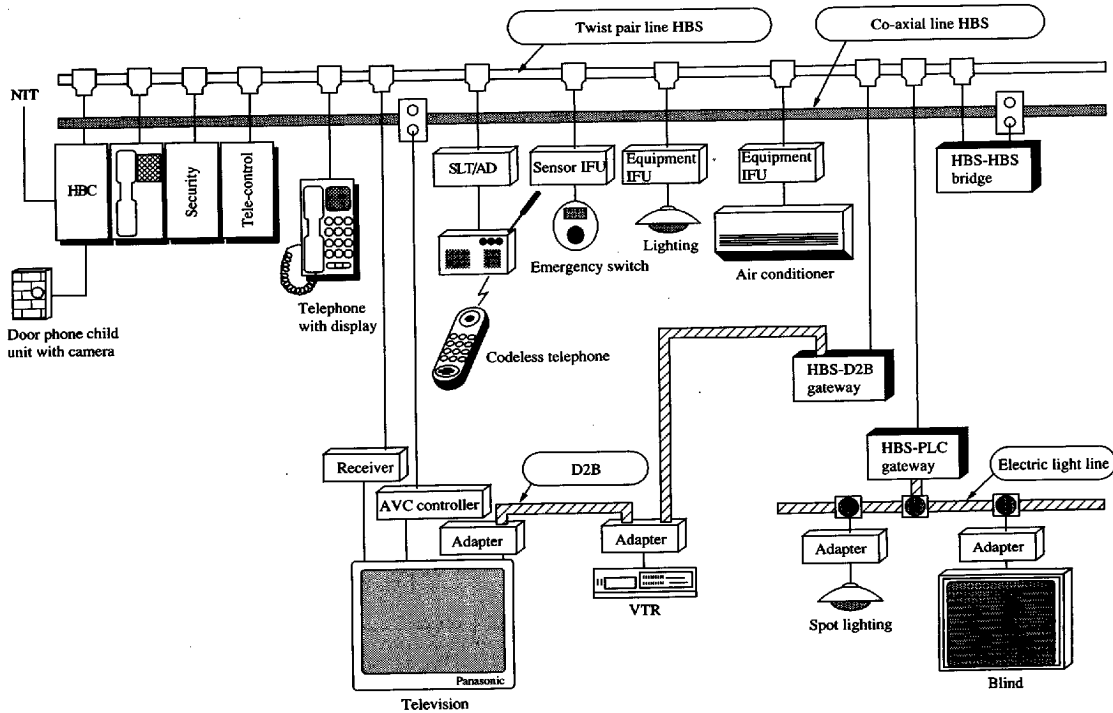
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■ For Reference

Equipment construction with the MN158819 and AN8019K/S



HBS system



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