Manual for

IPC/1 19" kortmagasin

Varenummer 6000t

Dansk Data Elektronik A/S
Januar 1989

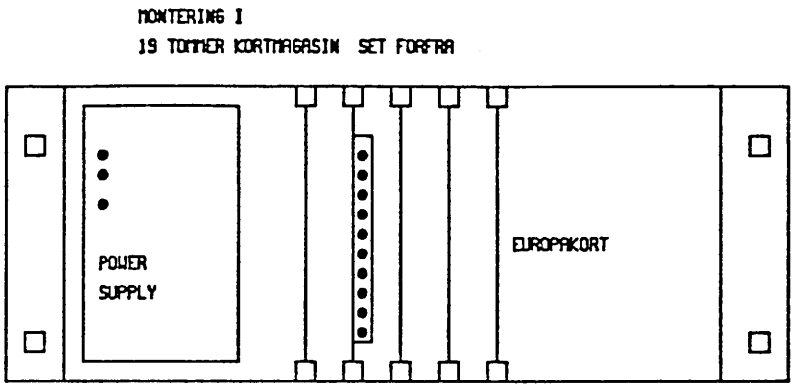
Ansvarlig: Gilbert E. Jensen

1. Introduktion

Det følgende afsnit beskriver opbygningen af kortmagasinet til 19" stel, og der omtales udbygning med flere udvidelseskabinetter. 19" kabinettet er tildelt varenummeret 6000t.

2. Mekanisk beskrivelse

IPC stationens montage i 19 tommer kortmagasin er skitseret i nedenstående figur 2.1.



Højde: 132.5 mm
Dybde: 310 mm

Figur 2.1

Stationen er her skitseret forfra. Længst til venstre er spændingsforsyningen anbragt og magasinet giver mod højre plads for montering af 14 europakort, med komponentsiden vendende bort fra strømforsyningen. Kablinger til periferimodulerne foretages udelukkende forfra via tilslutning til europakortenes topkonnektorer. Lodret bag europakortene er motherboardet med 14 korttilslutninger monteret. Bagsiden af kortmagasinet er skærmet totalt bortset fra en tilslutningsledning for 220 V AC eller 48 V DC. Denne ledning er ført ud gennem bagpladen via gennemføringstylle og kabelaflastning. Umiddelbart ved netledningens indføring findes netfilteret anbragt.

Hvis en IPC-station udstrækker sig over mere end et kortmagasin vil udvidelseskabinettet normalt være anbragt over eller under hovedkabinettet. Sammenkoblingen af kabinettet foretages via et 50 leder fladkabel, som tilsluttes et repeater modul (6052) i begge ender. Disse repeater moduler kan placeres i en vilkårlig kortposition i kabinetterne som alle øvrige ind/ud moduler. Den fordelagtigste position er imidlertidig den fjerneste konnektor fra strømforsyningen a.h.t. kabelføringen. Ved udvidelse med mere end et kabinet kobles de øvrige udvidelseskabinetter alle til hovedkabinettet efter samme metode (stjernekobling). Der vil således sidde et repeater modul i alle udvidelseskabinetter og lige så mange repeater moduler i hovedkabinettet, som der er udvidelseskabinetter. Principielt er hoved- og udvidelseskabinetterne ens; hovedkabinettet er kun karakteriseret ved at centralenheden og lagermodulet findes anbragt i dette kabinet.

Manual for

IPC/1 7R stangbyggesæt

Varenummer 6000r

Dansk Data Elektronik A/S
Januar 1989

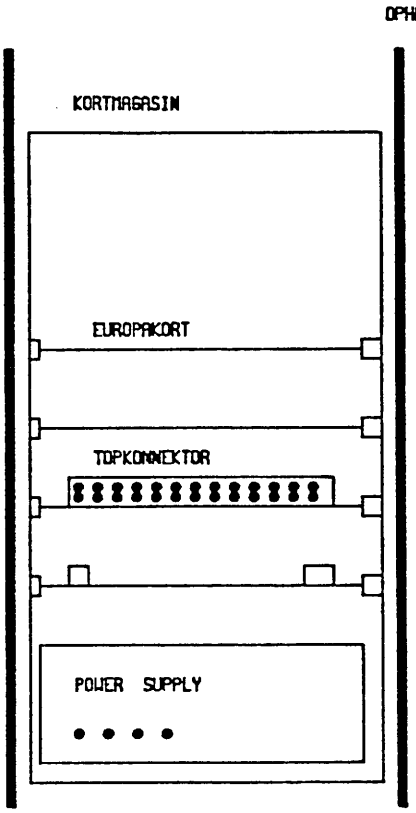
Ansvarlig: Gilbert E. Jensen

1. Introduktion

Det følgende afsnit beskriver opbygningen af kortmagasinet til 7R stangbyggesæt, og der omtales udbygning med flere udvidelseskabinetter. 7R kabinettet er tildelt varenummeret 6000t.

2. Mekanisk beskrivelse

Monteringen i stangbyggesættet 7R fra Siemens er skitseret i nedenstående figur 2.1. Kortmagasinet er anbragt lodret og europakortene findes vandret monteret. Principielt er 7R monteringen en 90 graders drejning af 19 tommer udførelsen, men den snævre indbygningsbredde i 7R fordrer et specielt kortmagasin.



436 mm

MONTERING I 7R
KORTMAGASIN SET FORFRA
FIG 2.2

118 mm

Figur 2.1

Indbygningsdybden incl. kappeudhæng (60 mm) er 282 mm. Den totale højde incl. monteringsbeslag er 486 mm.

Kableføringen til periferien foretages forfra; dog vil hovedspændingsforsyningen komme ind bagfra. Hvis IPC/1 stationen er udvidet til mere end et kortmagasin vil kabinetterne normalt være monteret ved siden af hinanden, og forbindelsen mellem magasinerne foretages med et 50 leder fladkabel (kabling identisk med 19 tommer udførelse).

Manual for

IPC/1 Power Supply 220 VAC, 50 W

Varenummer 6000a

Dansk Data Elektronik A/S
Januar 1989

Ansvarlig: Gilbert E. Jensen

1. Introduktion

Der leveres 3 typer spændingsforsyninger til IPC/1 systemet afhængig af den eksterne forsyning samt ydelse:

1) Varenummer 6000a: 220 VAC; 50 Watt
2) Varenummer 6000b: 220 VAC; 170 Watt
3) Varenummer 6000d: 48 VDC; 50 Watt

I det følgende beskrives IPC/1 6000a.

2. Specifikationer

Ethvert kortmagasin i IPC/1 systemet indeholder en af ovenstående spændingsforsyninger. Karakteristika for strømforsyningen:

Varenummer: 6000a (forsyning type TPS 19/DDE)

Indgang: 220 VAC, +/- 10%, 45-400 Hz.

Netfilter: FN332-3/05. Jorden er forbundet til kabinettet.

Elektromagnetisk kompatibilitet (EMC):

Følsomhed for støj, der via netledningen føres fra omgivelserne ind i apparatet (Conducted Susceptibility), overholder den svenske industrinorm **SEN361503 klasse 2.**

Støj hidrørende fra apparatet og udsendt på netledningen til omgivelserne (Conducted Emission), overholder den tyske norm for støjspænding **VDE 0871B.**

Udgang 1:	+5 V / 6.0 A (justerbar fra kassettens forplade)
2:	+12 V / 0.5 A
3:	-12 V / 0.1 A
4:	-24 V / 0.5 A

Udgang 1,2 og 3 har fælles GND, mens udgang 4 er galvanisk adskilt fra de øvrige.

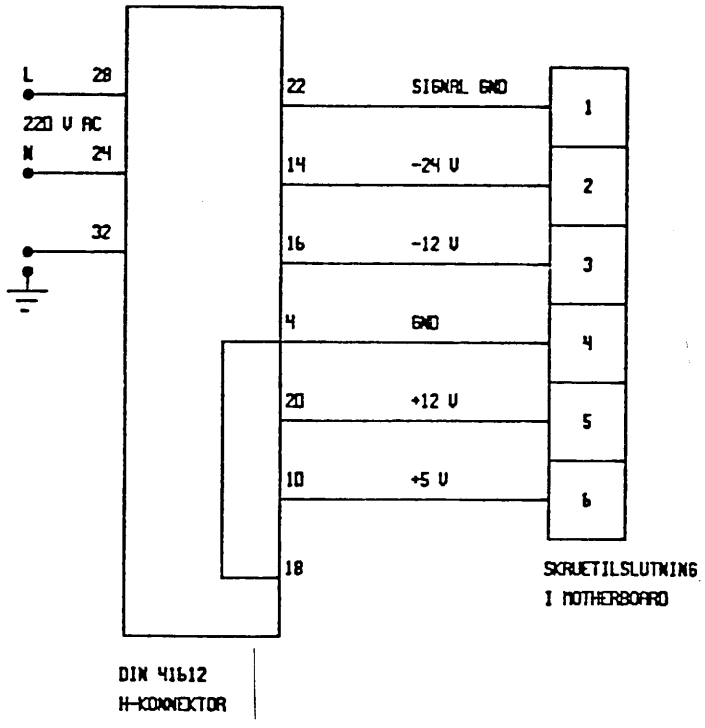
3. Mekanisk beskrivelse

Spændingsforsyningen IPC/1 6000a består af en 28 TE europakassette, i hvilken der findes:

modul 1: spændingsforsyning type TPS /DDE
(+5V/6A; +12V/0.5A; -12V/0.1A)

modul 2: spændingsforsyning type TPS /DDE
(+24V/0.5A)

Modul 1 er forsynet med lysdioder, sikringsholder samt netafbryder, der alle er ført ud gennem kassettens forplade. Bagtil er modul 1 bestykket med en DIN41612 type H konnektor, der tilsluttes motherboardet med løse ledninger. Modul 2's forbindelser er ført ind i modul 1's konnektor. Figur 3.1 viser spændingsforsyningen.



Figur 3.1

Manual for

IPC/1 Power Supply 220 VAC, 170 W

Varenummer 6000b

Dansk Data Elektronik A/S
Januar 1989

Ansvarlig: Gilbert E. Jensen

1. Introduktion

Der leveres 3 typer spændingsforsyninger til IPC/1 systemet afhængig af den eksterne forsyning samt ydelse:

1) Varenummer 6000a: 220 VAC; 50 Watt
2) Varenummer 6000b: 220 VAC; 170 Watt
3) Varenummer 6000d: 48 VDC; 50 Watt

Idet følgende beskrives IPC/1 6000b.

2. Specifikationer

Ethvert kortmagasin i IPC/1 systemet indeholder en af ovenstående spændingsforsyninger. Karakteristika for strømforsyningen:

Varenummer: 6000b (forsyning type PLB 6215/6231).

Indgang: 230 VAC (184-264 VAC), 47-400 Hz.

Netfilter: FN332-3/05. Jorden er forbundet til kabinettet.

Elektromagnetisk kompatibilitet (EMC):

Følsomhed for støj, der via netledningen føres fra omgivelserne ind i apparatet (Conducted Susceptibility), overholder den svenske industrinorm **SEN361503 klasse 2.**

Støj hidrørende fra apparatet og udsendt på netledningen til omgivelserne (Conducted Emission), overholder den tyske norm for støjspænding **VDE 0871B** samt normen **FCC 15-JB.**

Sikkerhed: Opfylder sikkerheds standarderne:

IEC 380, 435, 950
VDE 0805, 0806
UL 478, 1012
CSA 22.2, No 143, 154, 220
BS 6301

Udgang 1:	+5 V / 8.0 A
2:	+12 V / 2.0 A
3:	-12 V / 0.8 A
4:	+24 V / 4.0 A

Alle udgange har fælles GND.

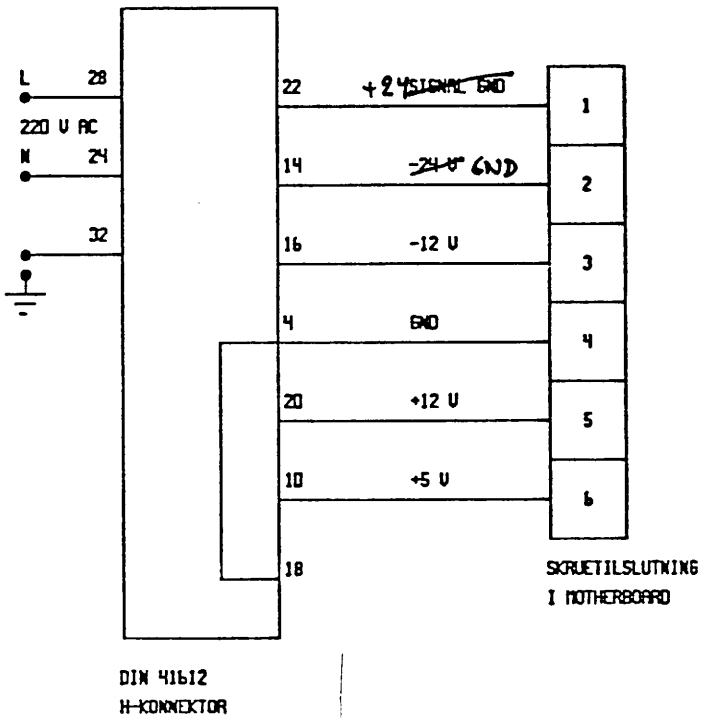
3. Mekanisk beskrivelse

Spændingsforsyningen IPC/1 6000b består af en 28 TE europakassette, i hvilken der er findes:

modul 1: spændingsforsyning type PLB6231/DDE
(+5V/8A; +12V/2.0A; -12V/0.8A)

modul 2: spændingsforsyning type PLB6215/DDE
(+24V/4.0A)

print: bruges til at forbinde de to power moduler med 220 VAC og motherboard via DIN 41612 type H konnektor. Diagrammet for tilslutnings-terminalerne er vist i figur 3.1. Printet indeholder desuden lysdioder til indikering af udgangsspændinger, samt en netafbryder.



Figur 3.1

Manual for

IPC/1 Power Supply 48 VDC, 50 W

Varenummer 6000d

Dansk Data Elektronik A/S
Januar 1989

Ansvarlig: Gilbert E. Jensen

1 Introduktion

Der leveres 3 typer spændingsforsyninger til IPC/1 systemet afhængig af den eksterne forsyning samt ydelse:

1) Varenummer 6000a: 220 VAC; 50 Watt
2) Varenummer 6000b: 220 VAC; 170 Watt
3) Varenummer 6000d: 48 VDC; 50 Watt

I det følgende beskrives IPC/1 6000d.

2. Specifikationer

Ethvert kortmagasin i IPC/1 systemet indeholder en af omstående spændingsforsyninger. Karakteristika for spændingsforsyningen:

Varenummer: 6000d (forsyning type TPS 36/48/DDE).

Indgang: 40-60 V DC.

Udgang 1: +5 V / 6.0 A (justerbar fra forpladen)
2: +12 V / 0.5 A
3: -12 V / 0.1 A
4: -24 V / 0.5 A

Udgang 1,2 og 3 har fælles GND, mens udgang 4 er galvanisk adskilt fra de øvrige.

Netfilter: FN332-3/05. Jorden er forbundet til kabinettet.

Elektromagnetisk kompatibilitet (EMC):

Følsomhed for støj, der via netledningen føres fra omgivelserne ind i apparatet (Conducted Susceptibility), overholder den svenske industrinorm **SEN361503 klasse 2.**

Støj hidrørende fra apparatet og udsendt på netledningen til omgivelserne (Conducted Emission), overholder den tyske norm for støjspænding **VDE 0871B.**

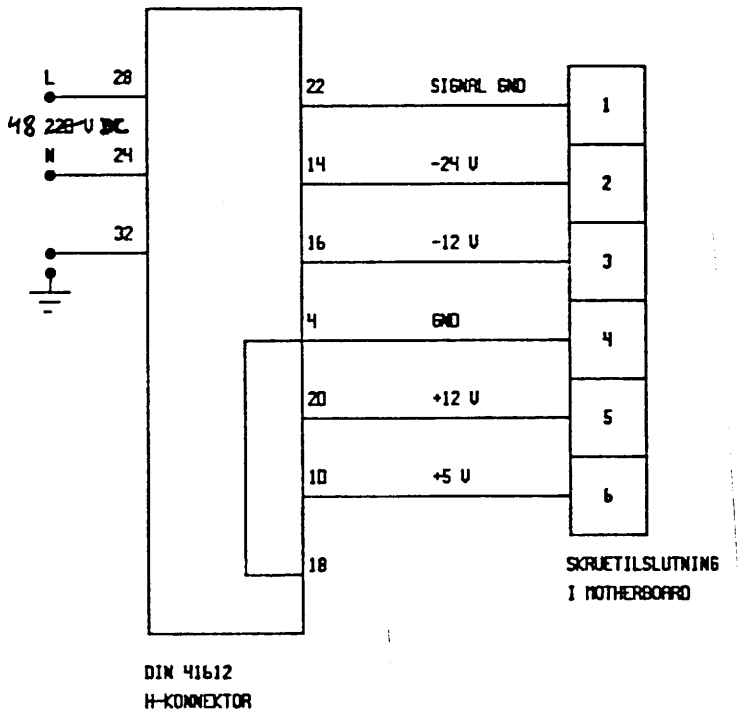
3. Mekanisk beskrivelse

Spændingsforsyningen 6000d består af en 28 TE europakasette i hvilken der findes:

modul 1: spændingsforsyning type TPS /DDE
(+5V/6A; +12V/0.5A; -12V/0.1A)

modul 2: spændingsforsyning type TPS /DDE
(+24V/0.5A)

Modul 1 er forsynet med lysdioder, sikringsholder samt netafbryder, der alle er ført ud gennem kassettens forplade. Bagtil er modul 1 bestykket med en DIN41612 type H konnektor, der tilsluttes motherboardet med løse ledninger. Modul 2's forbindelser er ført ind i modul 1's konnektor. Figur 3.1 viser tilslutning til DIN41612 type H konnektoren.



Figur 3.1

MANUAL

for

IPC/1 A/D konverterkort 6016i

Dansk Data Elektronik A/S

Sept. 1984.

Forfatter Allan Petersen

Sept. 1984

Indholdsfortegnelse:

Introduktion.

IPC/1 6016i modulet er et analogt input kort med 10 bits A/D konvertering og 8 galvanisk adskilte inputkanaler. Indgangsområdet er 0 til 1 Volt. Kortet kr ver en +15 V spændingsforsyning (f.eks. IPC/1 6092) foruden standard-spændingerne i IPC-forsyningen.

Inputkanalerne er isoleret fra processorstel; isolations-spænding 1500 V DC.

Konverteringstid:	50 uS
Skiftetid for valg af ny kanal:	3 mS
Max antal valg af hver kanal:	3 gange pr. sekund (gælder for relæudgave af kortet; for udgaven med solid state switche er antalg valg kun begrænset af skiftetiden).

Indgangsfølsomhed : 1,000 V DC for fuld udstyring.
Indgangsimpedans : > 20 M ohm i udstyringsområdet.
CMR : typisk 94 dB (gælder også CMR mellem hver kanal).

Kortet er ikke forsynet med indgangsfiltrering af de analoge signaler før kanalvalg, men er forsynet med transientbeskyt-telse ved isolationsforstærkeren. Kortet har justeringsmulig-hed for samlet offset og gain.

Såfremt der ønskes konvertering af 4 - 20 mA (0 -20 mA) strøm-sløjfesignaler, forsynes indgangene med modstande (50,0 ohm) til strøm/spændingskonvertering.

Tilslutning til periferien foretages via Europakonnektor DIN 41612, byggeform B, 64 polet hanstik.

Funktionel beskrivelse.

Kortet er opbygget med en 8 kanals multiplexer til valg af den ønskede målekanal, en isolationsforstærker til galvanisk adskillelse af indgangs- og processorside, et sample/hold kredsløb og en 10 bit A/D konverter samt businterface og kontrolkredsløb.

Den ønskede kanal vælges ved at give en OUT instruktion med kanalnr. til kortet. Et sekvenskredsløb på kortet vil da sørge for først at åbne alle indgangsswitche samt vente indtil switchenes delay- og off-tider er overholdt, for dernæst at indvælge den ønskede kanal samt vente indtil delay- og on-tider er overholdt.
Først da (ca. 3 mS) vil en bit i statusordet indikere "relæ select ready".

Sample/hold og konvertering kan på et ønsket tidspunkt startes med en OUT instruktion til kortet.

Kortet optager to I/O adresser; basisadressen sættes på kortet på et switch register. Den til kortet hørende type-adresse (TYPE = 4) er fast kodet i printet.

Adressering:

I/O ADRESSER:

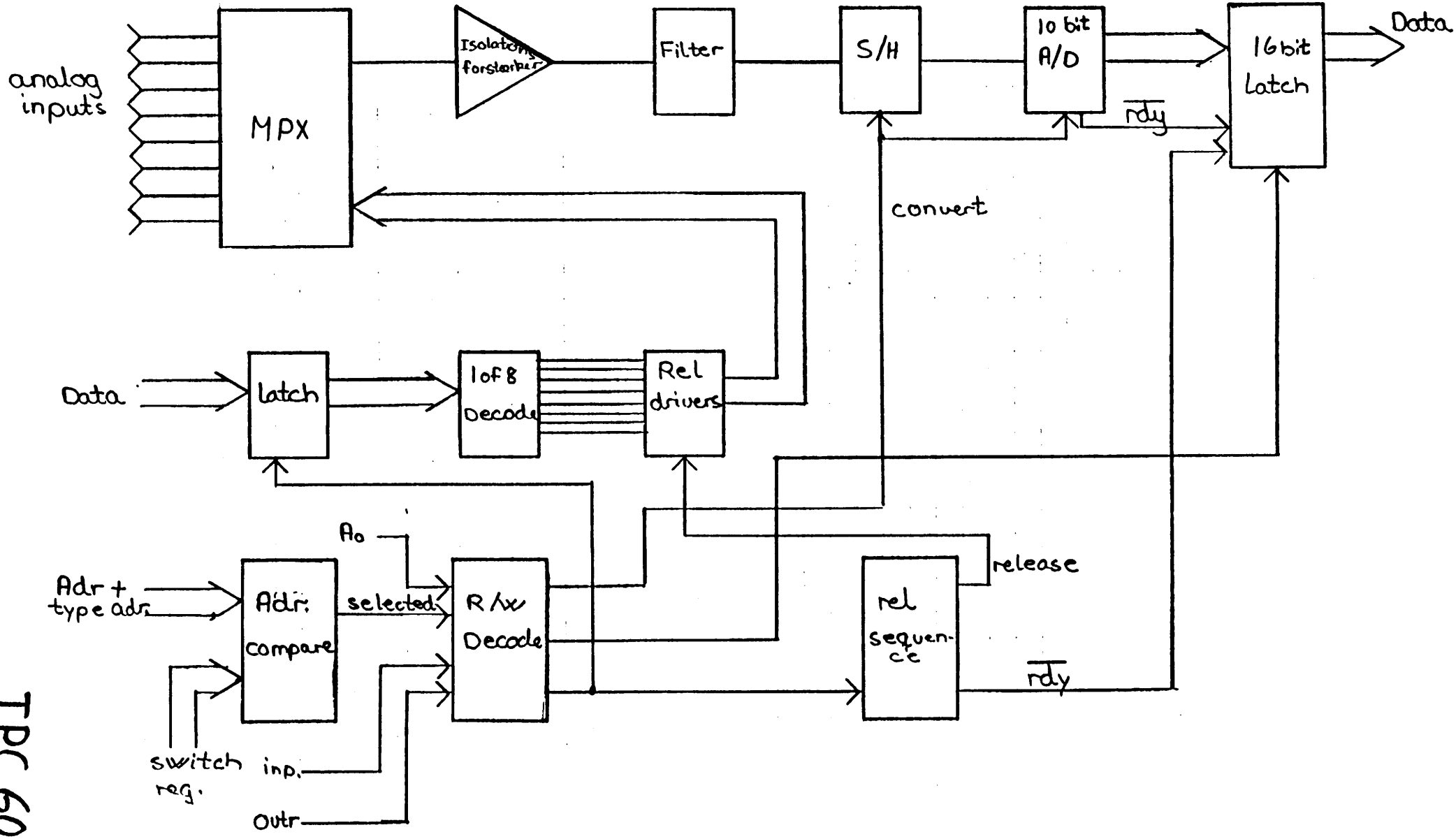
Switch på kortet stilles til 2n:

		Bit7							Bit0
IN (2n+1):	Læs MSB:	D9	D8	D7	D6	D5	D4	D3	D2
IN (2n):	Læs status og LSB:	RN	DN	R2	R1	R0	0	D1	D0
OUT (2n+1):	Latch relay nr:	X	X	X	X	X	R2	R1	R0
OUT (2n):	Start konvertering:	X	X	X	X	X	X	X	X

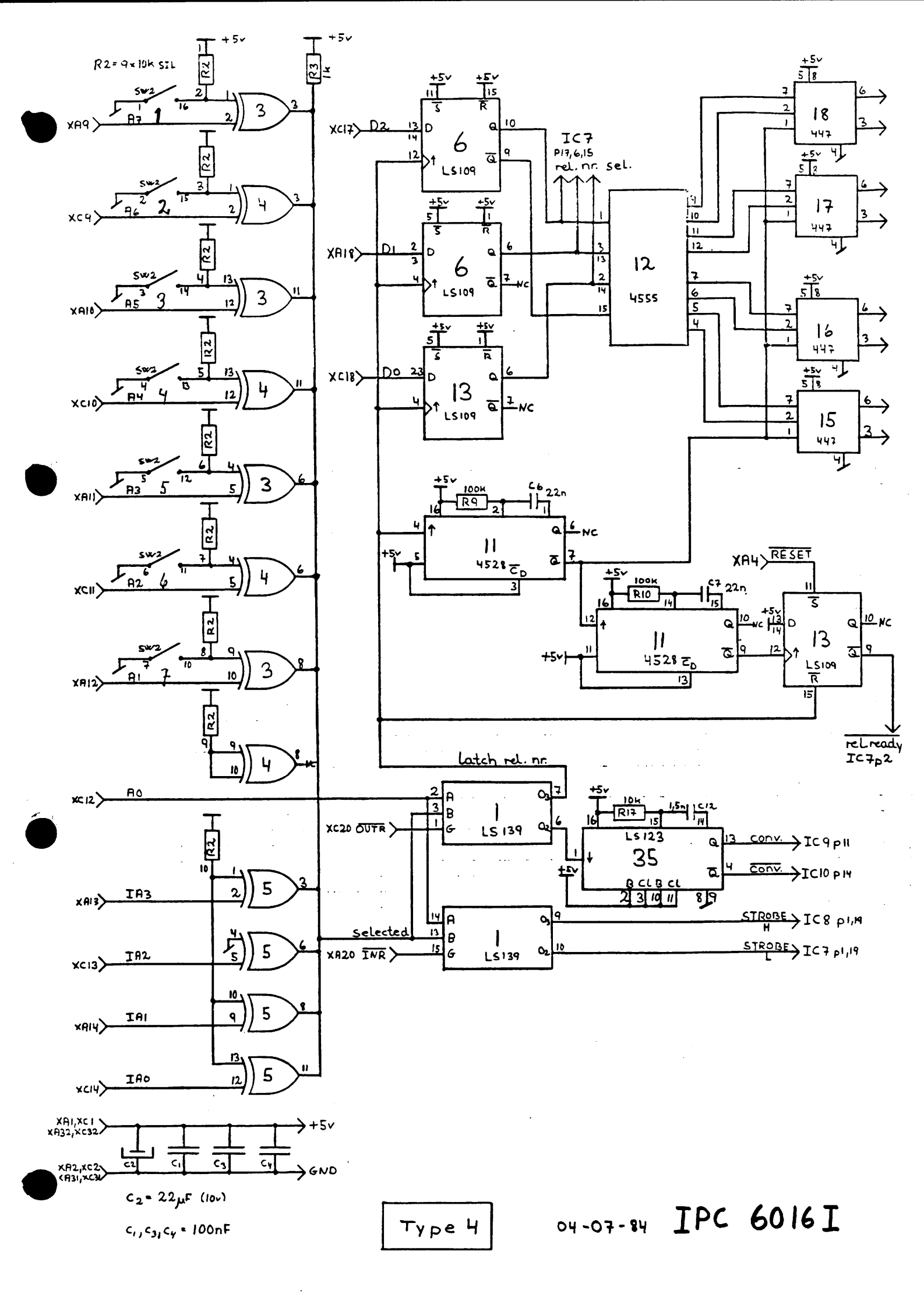
hvor:

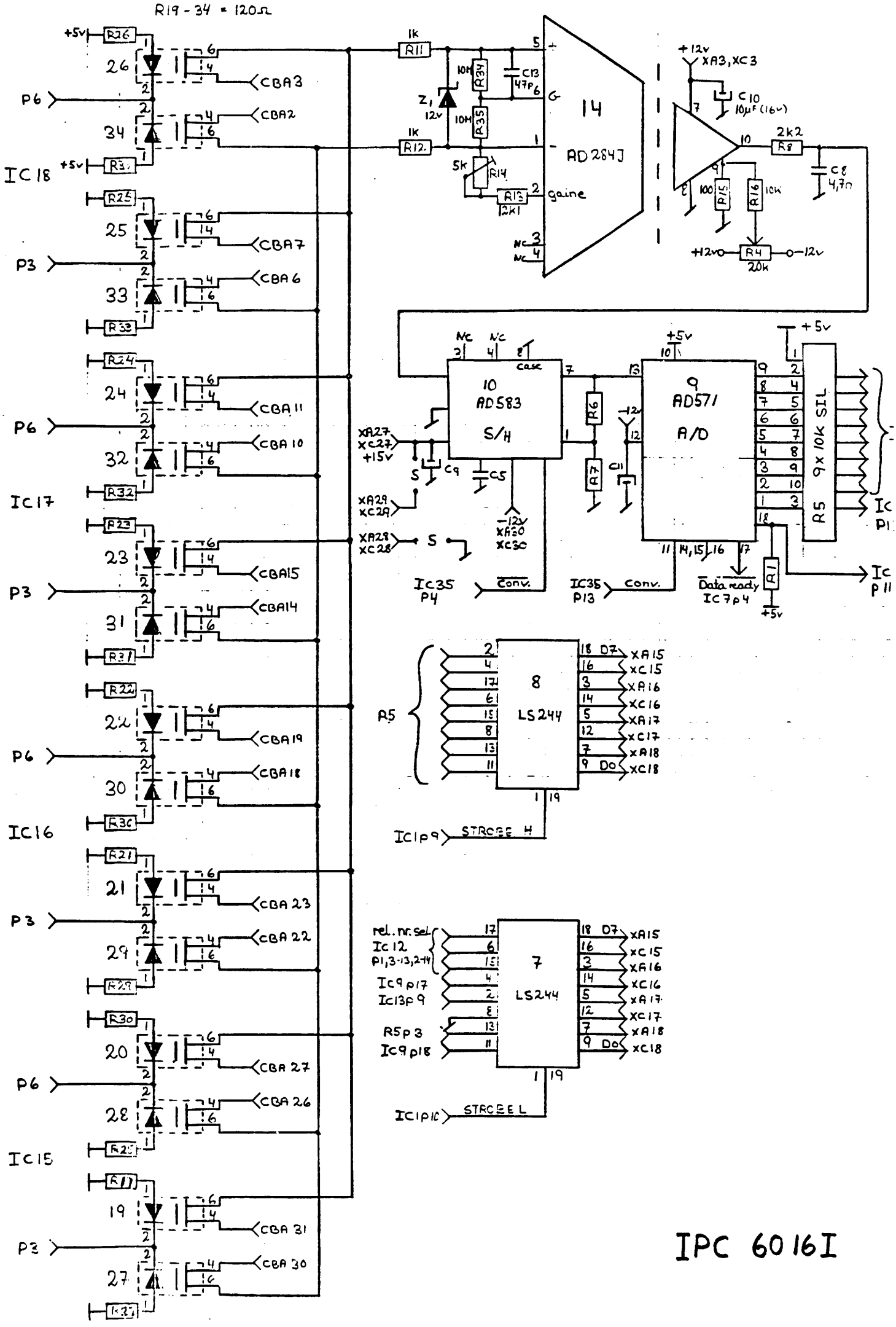
D9 - D0	Data fra A/D konverter
R2 - R0	Valgt relæ
RN	Relay ready (aktiv lav!)
DN	Data ready (aktiv lav!)
0	Altid lav.
X	Don't care

TYPE = 4.


analog inputs
MPX
Isolation/ forstarker
Filter
S/H
10 bit A/D
16 bit Latch
Data
rdy
convert
Data
latch
1 of 8 Decode
Rel drivers
A0
Adr + type adr.
Adr. compare
selected
R/w Decode
release
rel sequen-ce
rdy
switch reg.
inp.
outr

IPC 6016 I


R2 = 9 x 10k SIL
+5v
R2
R3 1k
SW2
XA9
XC9
XA10
XC10
XA11
XC11
XA12
XC12
A0
XA13
IA3
XC13
IA2
XA14
IA1
XC14
IA0
XC17
D2
XA18
D1
XC18
D0
IC7 P17,6,15 rel. nr. sel.
LS109
12 4555
18 447
17 447
16 447
15 447
11 4528
R9 100k
C6 22n
XA4 RESET
R10 100k
C7 22n
13 LS109
rel.ready IC7p2
latch rel. nr.
XC12 A0
XC20 OUTR
XA20 INR
selected
1 LS139
LS123 35
R17 10k
1,5n C12
conv. IC9 p11
conv. IC10 p14
STROBE H IC8 p1,19
STROBE L IC7 p1,19
XA1,XC1 XA32,XC32
XA2,XC2 XA31,XC31
C2 C1 C3 C4
+5v
GND
C2 = 22µF (10v)
C1, C3, C4 = 100nF
Type 4
04-07-84
IPC 6016I


R19 - 34 = 120Ω
IC 18
IC 17
IC 16
IC 15
P6
P3
CBA3
CBA2
CBA7
CBA6
CBA11
CBA10
CBA15
CBA14
CBA19
CBA18
CBA23
CBA22
CBA27
CBA26
CBA31
CBA30
AD 284J
AD583 S/H
AD571 A/D
9x 10K SIL
LS244
STROBE H
STROBE L
Conv.
Data ready
IPC 6016I

Komponentliste:

Komponentliste IPC 6016i

Navn	Komponent	pins	Fabrikat
IC1	74LS139N	16	Texas
IC3	74LS136N	14	Texas
IC4	74LS136N	14	Texas
IC5	74LS136N	14	Texas
IC6	74LS109AN	16	Texas
IC7	74LS244N	20	Texas
IC8	74LS244N	20	Texas
IC9	AD571JD	18	Analog Devices
IC10	AD583K	14	Analog Devices
IC11	HEF4528BP	16	Philips
IC12	HEF4555BP	16	Philips
IC13	74LS109AN	16	Texas
IC14	284 J Isol.amp.	10	Analog Devices
IC15	SN75447P	8	Texas
IC16	SN75447P	8	Texas
IC17	SN75447P	8	Texas
IC18	SN75447P	8	Texas
IC35	74LS123N	16	Texas

a) På relæ-udgaven af kortet er:

RL19	104 A 64 5 V. Reedrelæ	Electrothermal
RL20	104 A 64 5 V. Reedrelæ	Electrothermal
RL21	104 A 64 5 V. Reedrelæ	Electrothermal
RL22	104 A 64 5 V. Reedrelæ	Electrothermal
RL23	104 A 64 5 V. Reedrelæ	Electrothermal
RL24	104 A 64 5 V. Reedrelæ	Electrothermal
RL25	104 A 64 5 V. Reedrelæ	Electrothermal
RL26	104 A 64 5 V. Reedrelæ	Electrothermal
RL27	104 A 64 5 V. Reedrelæ	Electrothermal
RL28	104 A 64 5 V. Reedrelæ	Electrothermal
RL29	104 A 64 5 V. Reedrelæ	Electrothermal

RL30	104 A 64 5 V. Reedrelæ	Electrothermal
RL31	104 A 64 5 V. Reedrelæ	Electrothermal
RL32	104 A 64 5 V. Reedrelæ	Electrothermal
RL33	104 A 64 5 V. Reedrelæ	Electrothermal
RL34	104 A 64 5 V. Reedrelæ	Electrothermal

b) På Solid state switch udgaven af kortet er:

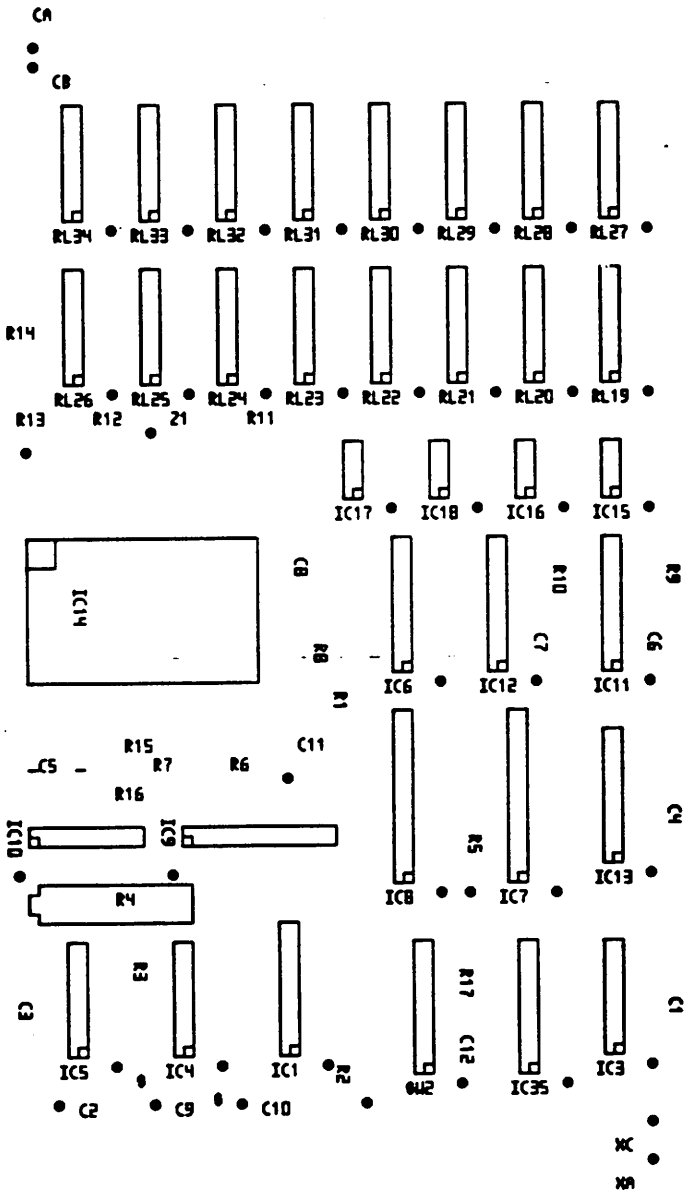
RL19 - RL34	7900-1 Mini Mos switch	Hamlin
og R19 - R 34	Modstand 120 ohm	

Z1	Zener 12 Volt 400 mW	
C1	100 nF afkobling	Siemens
C2	22 uF, 10 V Sol.Al.	Philips
	(Philip kodenr. 2222 122 54229)	
C3	100 nF afkobling	Siemens
C4	100 nF afkobling	Siemens
C5	1 nF Micropoco	Philips
	(Philips kodenr. 2222 425 41002)	
C6	22 nF Keramisk 2e	Philips
C7	22 nF Keramisk 2e	Philips
C8	4,7 nF Keramisk 2e	Philips
C9	10 uF, 16 V Sol.Al.	Philips
	(Philips kodenr. 2222 122 55109)	
C10	10 uF, 16 V Sol.Al.	Philips
C11	10 uF, 16 V Sol.Al.	Philips
C12	1,5 nF Keramisk 2e	Philips
C13	47pF Keramisk 2e	Philips

R1	Modstand 10 k
R2	Sil modst. 9x1k
R3	Modstand 1 k
R4	Trimmepot. 10 turn, 20 k
R5	Sil modst. 9x10k
R6	Modstand 5,62 k METALFILM

R7	Modstand 5,62 k METALFILM
R8	Modstand 2,2 k
R9	Modstand 100 k
R10	Modstand 100 k
R11	Modstand 1 k
R12	Modstand 1 k
R13	Modstand 12,1 k METALFILM
R14	Trimmepot 5 k (f.eks Bourns 3386H-1-502)
R15	Modstand 100 ohm
R16	Modstand 10 k
R17	Modstand 10 k
R35	Modstand 10 M ohm METALFILM
R36	Modstand 10 M ohm METALFILM
SW2	Dil switch, 7 switches (evt 8)
XA/XB	Euro-connector, 64 pin (a og c)
CA/CB	Euro-connector, 64 pin (a og b)

Komponentplacering:



Forbindelser til stik:

Pin:	a	b
1	NC.	NC.
2	Ch. 8 Neg.	Ch. 8 Neg.
3	Ch. 8 Pos.	Ch. 8 Pos.
4	NC.	NC.
5	NC.	NC.
6	Ch. 7 Neg.	Ch. 7 Neg.
7	Ch. 7 Pos.	Ch. 7 Pos.
8	NC.	NC.
9	NC.	NC.
10	Ch. 6 Neg.	Ch. 6 Neg.
11	Ch. 6 Pos.	Ch. 6 Pos.
12	NC.	NC.
13	NC.	NC.
14	Ch. 5 Neg.	Ch. 5 Neg.
15	Ch. 5 Pos.	Ch. 5 Pos.
16	NC.	NC.
17	NC.	NC.
18	Ch. 4 Neg.	Ch. 4 Neg.
19	Ch. 4 Pos.	Ch. 4 Pos.
20	NC.	NC.
21	NC.	NC.
22	Ch. 3 Neg.	Ch. 3 Neg.
23	Ch. 3 Pos.	Ch. 3 Pos.
24	NC.	NC.
25	NC.	NC.
26	Ch. 2 Neg.	Ch. 2 Neg.
27	Ch. 2 Pos.	Ch. 2 Pos.
28	NC.	NC.
29	NC.	NC.
30	Ch. 1 Neg.	Ch. 1 Neg.
31	Ch. 1 Pos.	Ch. 1 Pos.
32	NC.	NC.

Testbeskrivelse:

Til test af A/D konverter kortet findes dels en testboks med 8 stk variable 0 til 1 Volt spændingsudgange, dels et testprogram, der på skærmen viser konverteringsresultatet for hver af de 8 kanaler.

Først justeres nulpunktet, idet potmeteret justeres til en visning på 0002 count på alle kanaler for en indgangsspænding på 0,0020 Volt DC på alle kanaler (en samlet justering).

Dernæst justeres samlet gain, idet gainpotmeteret justeres til en visning på 1022 counts på alle kanaler med en indgangsspænding på 0,9990 Volt DC.

Endelig testes lineariteten, idet der skal være følgende sammenhæng mellem spænding og antal counts:

Påtrykt spænding:	Antal counts:	Max afvigelse:
0,0000 Volt	0000	+- 2 counts
0,0020 Volt	0002	+- 2 counts
0,1000 Volt	0102	
0,2000 Volt	0205	
0,3000 Volt	0307	
0,4000 Volt	0409	
0,5000 Volt	0512	+- 4 counts
0,6000 Volt	0614	
0,7000 Volt	0716	
0,8000 Volt	0818	
0,9000 Volt	0921	
0,9990 Volt	1022	+- 2 counts
1,0000 Volt	1023	+- 2 counts

ANALOG DEVICES

Economy, High Performance, Self Contained, Isolation Amplifier

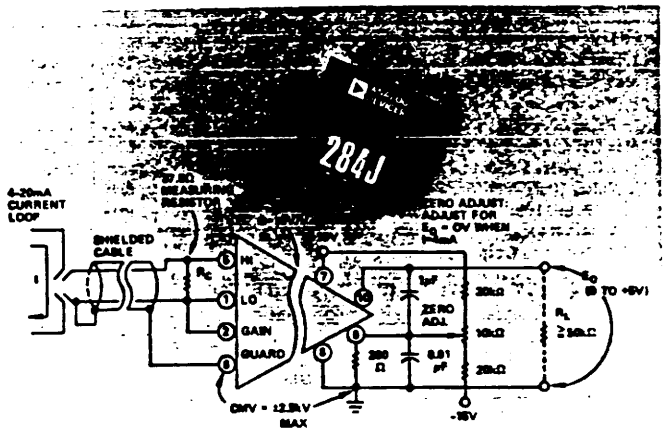
MODEL 284J

FEATURES

Low Cost
Low Nonlinearity: ±0.05% @ 10V pk-pk Output
High Gain Stability: ±0.0075%/°C, ±0.001%/1000 hours
Isolated Power Supply: ±8.5V dc @ ±5mA
High CMR: 110dB min with 5kΩ Imbalance
High CMV: ±5000V_{pk}, 10ms Pulse; ±2500V dc continuous
Small Size: 1.5" x 1.5" x 0.6"
Adjustable Gain: 1 to 10V/V; Single Resistor Adjust
Meets IEEE Std 472: Transient Protection (SWC)
Meets UL Std 544 Leakage: 2.0μA max @ 115V ac, 60Hz

APPLICATIONS

Biomedical and Patient Monitoring Instrumentation
Ground Loop Elimination in Industrial Control
Off-Ground Signal Measurements
4-20mA Isolated Current Loop Receiver



ISOLATED 4-20mA ANALOG INTERFACE

GENERAL DESCRIPTION

Model 284J is a low cost isolation amplifier featuring isolated power, ±8.5V dc @ ±5mA loads, ±2500V dc off-ground isolation (CMV) and 110dB minimum CMR at 60Hz, 5kΩ source imbalance, in a compact 1.5" x 1.5" x 0.6" epoxy encapsulated package. This improved design achieves low nonlinearity of ±0.05% @ 10V pk-pk output, gain stability of ±0.0075%/°C and input offset drift of ±15μV/°C at G=10V/V. Using modulation techniques with reliable transformer isolation, model 284J will interrupt ground loops, leakage paths and high voltage transients to ±5kV_{pk} (10ms pulse) providing dc to 1kHz (-3dB) response over an adjustable gain range of 1V/V to 10V/V. Model 284J's fully floating guarded input stage and floating isolated power for external input circuitry, offers versatility for both medical and industrial OEM applications.

WHERE TO USE MODEL 284J

Medical Applications: In all biomedical and patient monitoring equipment such as multi-lead ECG recorders and portable diagnostic designs, model 284J offers protection from lethal ground fault currents as well as 5kV defibrillator pulse inputs. Low level bioelectric signal recording is achieved with model 284J's low input noise (8μV p-p) and high CMR (110dB, min).

Industrial Applications: In computer interface systems, process signal isolators and high CMV instrumentation, model 284J offers complete galvanic isolation and protection against damage from transients and fault voltages. High level transducer interface is afforded with model 284J's 10V pk-pk input signal capability at a gain of 1V/V operation. In portable field designs, model 284J's single supply, low power drain of 85mW @ +12V operation offers long battery operation.

DESIGN FEATURES AND USER BENEFITS

Isolated Power: Dual ±8.5V dc @ ±5mA, completely isolated from the input power terminals (±2500V dc isolation), provides the capability to excite floating signal conditioners, front end buffer amplifiers and remote transducers such as thermistors or bridges.

Adjustable Gain: Model 284J's adjustable gain combined with its 10V pk-pk output signal dynamic range offers compatibility with a wide class of input signals. A single external resistor enables gain adjustment from 1V/V to 10V/V providing the flexibility of applying model 284J in both high level transducer interfacing as well as low level sensor measurements.

Floating, Guarded Front-End: The input stage of model 284J can directly accept floating differential signals, such as ECG biomedical signals, or it may be configured as a high performance instrumentation front-end to accept signals having CMV with respect to input power common.

High Reliability: Model 284J is a conservatively designed, compact module, capable of reliable operation in harsh environments. Model 284J has a calculated MTBF of over 400,000 hours and is designed to meet MIL-STD-202E environmental testing as well as the IEEE Standard for Transient Voltage Protection (472-1974: Surge Withstand Capability). As an additional assurance of reliability, every model 284J is factory tested for CMV and input ratings by application of 5kV pk, 10ms pulses, between input terminals as well as input/output terminals.

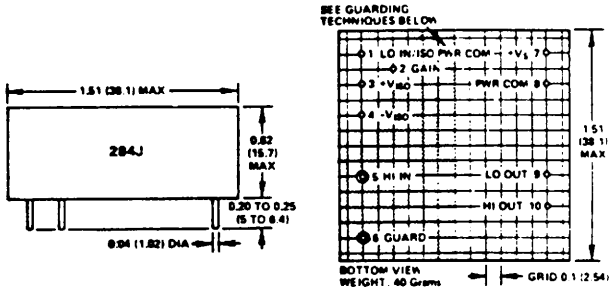
SPECIFICATIONS (typical @ 25°C and V_S = +15V dc unless otherwise noted)

MODEL	284J
GAIN (NON-INVERTING)	
Range (50kΩ Load)	1 to 10V/V
Formula	$\text{Gain} = \left[1 + \frac{100k\Omega}{10.7k\Omega + R_1(k\Omega)}\right]$
Deviation from Formula	±3%
vs. Time	±0.001%/1000 Hours
*vs. Temperature (0 to +70°C)[1]	±0.0075%/°C
*Nonlinearity, G = 1V/V to 10V/V[2]	±0.05%
INPUT VOLTAGE RATINGS	
Linear Differential Range, G = 1V/V	±5V min
Max Safe Differential Input	
Continuous	$240V_{rms}$
Pulse, 10ms duration, 1 pulse/10 sec	$\pm 6500V_{pk}$ max
Max CMV, Inputs to Outputs	
AC, 60Hz, 1 minute duration	$2500V_{rms}$
Pulse, 10ms duration, 1 pulse/10 sec	$\pm 2500V_{pk}$ max
With 510kΩ in series with Guard	$\pm 5000V_{pk}$ max
Continuous, ac or dc	$\pm 2500V_{pk}$ max
CMR, Inputs to Outputs, 60Hz, $R_S \leq 5k\Omega$	
Balanced Source Impedance	114dB
5kΩ Source Impedance Imbalance	110dB min
CMR, Inputs to Guard, 60Hz	
1kΩ Source Impedance Imbalance	78dB
Max Leakage Current, Inputs to Power Common	
@ 115V ac, 60Hz	2.0μA rms max
INPUT IMPEDANCE	
Differential	$10^8\Omega \| 70pF$
Overload	300kΩ
Common Mode	$5 \times 10^{10}\Omega \| 20pF$
INPUT DIFFERENCE CURRENT	
Initial, @ +25°C	±7nA max
vs. Temperature (0 to +70°C)	±0.1nA/°C
INPUT NOISE	
Voltage, G = 10V/V	
0.05Hz to 100Hz	8μV p-p
10Hz to 1kHz	10μV rms
Current	
0.05Hz to 100Hz	5pA p-p
FREQUENCY RESPONSE	
Small Signal, -3dB, G = 1V/V to 10V/V	1kHz
Slew Rate	25mV/μs
Full Power, 10V p-p Output	
Gain = 1V/V	700Hz
Gain = 10V/V	200Hz
Recovery Time, to ±100μV after Application	
of $\pm 6500V_{pk}$ Differential Input Pulse	200ms
OFFSET VOLTAGE REFERRED TO INPUT	
*Initial, @ +25°C, Adjustable to Zero	±(5 + 20/G)mV
*vs. Temperature (0 to +70°C)	±(1 + 150/G)μV/°C
vs. Supply Voltage	±1mV/%
ATED OUTPUT	
Voltage, 50kΩ Load	±5V min
Output Impedance	1kΩ
Output Ripple, 1MHz Bandwidth	5mV pk-pk
ISOLATED POWER OUTPUTS	
Voltage, ±5mA Load	±8.5V dc
Accuracy	±5%
Current	±5mA min
Regulation, No Load to Full Load	+0, -15%
Ripple, 100kHz Bandwidth	100mV p-p
POWER SUPPLY, SINGLE POLARITY[3]	
Voltage, Rated Performance	+15V dc
Voltage Operating	+(8 to 15.5)V dc
Current, Quiescent	+10mA
TEMPERATURE RANGE	
Rated Performance	0 to +70°C
Operating	-25°C to +85°C
Storage	-55°C to +85°C
CASE DIMENSIONS	1.5" x 1.5" x 0.62"

*Improved performance over earlier design.
[1] Gain temperature drift is specified as a percentage of output signal level.
[2] Gain nonlinearity is specified as a percentage of 10V pk-pk output span.
[3] Recommended power supply, ADI model 904, ±15V @ 50mA output
Specifications subject to change without notice.

OUTLINE DIMENSIONS

Dimensions shown in inches and (mm).



SHIELDED MOUNTING SOCKET AC1049

INTERCONNECTION AND GUARDING TECHNIQUES

Model 284J can be applied directly to achieve rated performance as shown in Figure 1 below. To preserve the high CMR performance of model 284J, care must be taken to keep the capacitance balanced about the input terminals. A shield should be provided on the printed circuit board under model 284J as illustrated in the outline drawing above (screened area). The GUARD (Pin 6) should be connected to this shield. This guard-shield is provided with the mounting socket, model AC1049. A recommended guarding technique using model AC1049 is illustrated in Figure 1. To reduce effective cable capacitance, cable shield should be connected to the common mode signal source by connecting the shield as close as possible to the signal low.

Offset Voltage Trim Adjust: The trim adjust circuit shown in Figure 1 can be used to zero the output offset voltage over the gain range from 1 to 10V/V. The output terminals, HI OUT and LO OUT, can be floated with respect to PWR COM up to $\pm 50V_{pk}$ max, offering three-port isolation. A 0.1μF capacitor is required from LO OUT to PWR COM whenever the output terminals are floated with respect to PWR COM. LO OUT can be connected directly to PWR COM when output offset trimming is not required.

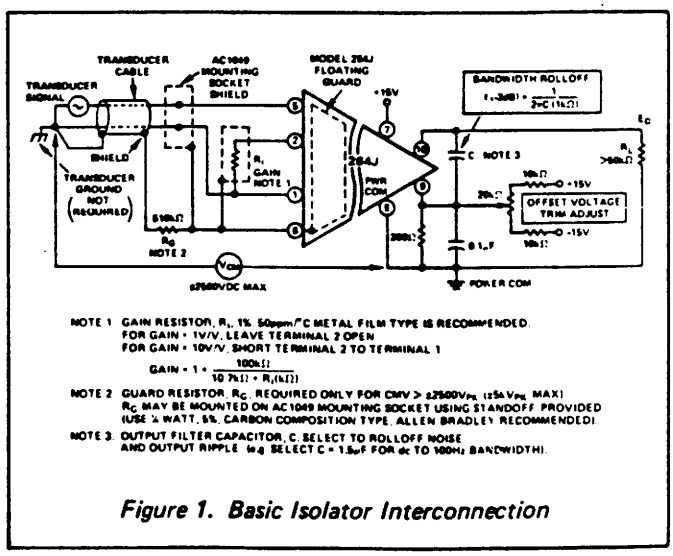


Figure 1. Basic Isolator Interconnection

THEORY OF OPERATION

The remarkable performance of model 284J is derived from the carrier isolation technique which is used to transfer both signal and power between the amplifier's guarded input stage and the rest of the circuitry. The block diagram for model 284J is shown in Figure 2 below.

The 320kΩ input protection resistor limits the differential input current during periods of input amplifier saturation and also limits the differential fault current to approximately 35μA in case the preamplifier fails.

The bipolar input preamplifier operates single-ended (non-inverting). Only a difference bias current flows with zero net bias current. A third wire return path for input bias current is not required. Gain can be set from 1V/V to 10V/V by changing the gain resistor, R_i. *To preserve high CMR, the gain resistor must be guarded.* Best performance is achieved by shorting terminal 2 to terminal 1 and operating model 284J at a gain of 10V/V.

For powering floating input circuitry such as buffer amplifiers, instrumentation amplifiers, calibration signals and transducers, dual isolated power is provided. High CMV isolation is achieved by the low-leakage transformer coupling between the input preamplifier, modulator section and the output circuitry. Only the 20pF leakage capacitance between the floating guarded input section and the rest of the circuitry keeps the CMR from being infinite.

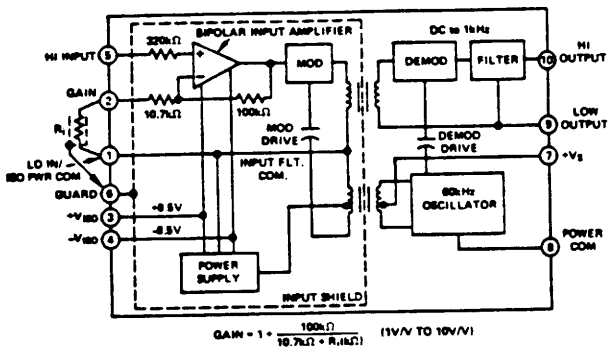


Figure 2. Block Diagram – Model 284J

INTERELECTRODE CAPACITANCE, TERMINAL RATINGS AND LEAKAGE CURRENTS LIMITS

Capacitance: Interelectrode terminal capacitance arising from stray coupling capacitance effects between the input terminals and the signal output terminals are each shunted by leakage resistance values exceeding 50kMΩ. Figure 3 illustrates the CMR ratings at 60Hz and 5kΩ source imbalance between signal input/output terminals, along with their respective capacitance.

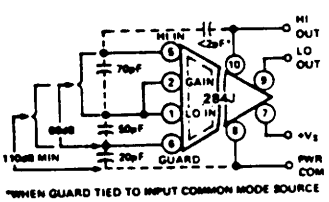


Figure 3. Model 284J Terminal Capacitance and CMR Ratings

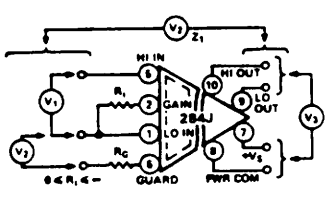


Figure 4. Model 284J Terminal Ratings

Terminal Ratings: CMV performance is given in both peak pulse and continuous ac or dc peak ratings. Pulse ratings are intended to support defibrillator and other transient voltages. Continuous peak ratings apply from dc up to the normal full power response frequencies. Figure 4 and Table 1 illustrate model 284J's ratings between terminals.

SYMBOL	RATING	REMARKS
V1 (pulse)	±6500V_{PK} (10ms)	Withstand Voltage, Defibrillator
V1 (cont.)	±240V_{RMS}	Withstand Voltage, Steady State
V2 (pulse)	±2500V_{PK} (10ms) R_G = 0	Transient
V2 (pulse)	±5000V_{PK} (10ms) R_G = 510kΩ	Isolation, Defibrillator
V2 (cont.)	±2500V_{PK}	Isolation, Steady State
V3 (cont.)	±50V_{PK}	Isolation, DC
Z1	50kMΩ‖20pF	Isolation Impedance

Table 1. Isolation Ratings Between Terminals

Leakage Current Limits: The low coupling capacitance between inputs and output yields a ground leakage current of less than 2.0μA rms at 115V ac, 60Hz (or 0.02μA/V ac). As shown in Figure 5, the transformer coupled modulator signal, through stray coupling, also creates an internally generated leakage current of about 5μA rms @ 60kHz. Line frequency leakage current levels are unaffected by the power on or off condition of model 284J.

For medical applications, model 284J is designed to improve on patient safety current limits proposed by F.D.A., U.L., A.A.M.I. and other regulatory agencies. (e.g. model 284J complies with leakage requirements for the Underwriters Laboratory STANDARD FOR SAFETY, MEDICAL AND DENTAL EQUIPMENT as established under UL544 for type A and B patient connected equipment – reference *Leakage Current*, paragraph 27.5).

In patient monitoring equipment, such as ECG recorders, model 284J will provide adequate isolation without exposing the patient to potentially lethal microshock hazards. Using passive components for input protection, this design limits input fault currents even under amplifier failure conditions.

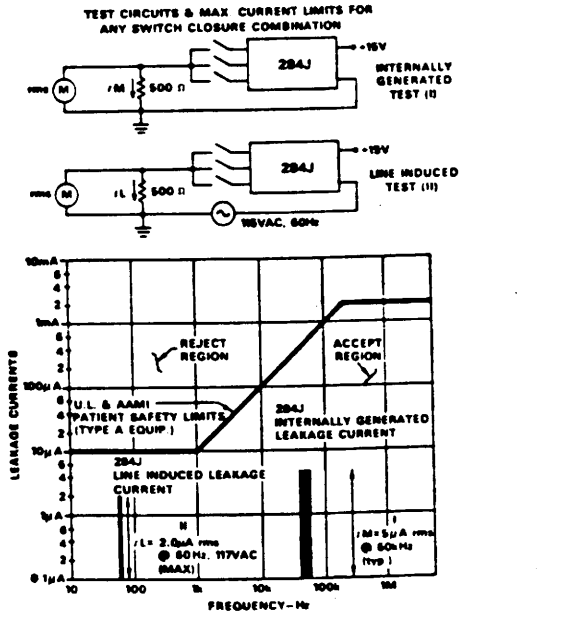


Figure 5. Model 284J Leakage Current Performance from Line Induced and Internally Generated (Modulator) Operating Conditions

PERFORMANCE CHARACTERISTICS

Common Mode Rejection: Input-to-Output CMR is dependent on source impedance imbalance, signal frequency and amplifier gain. CMR is rated at 115V ac, 60Hz and 5kΩ imbalance at a gain of 10V/V. Figure 6 illustrates CMR performance as a function of signal frequency. CMR approaches 146dB at dc with source imbalances as high as 5kΩ. As gain is decreased, CMR is reduced. At a gain of 1V/V, CMR is typically 6dB lower than at a gain of 10V/V.

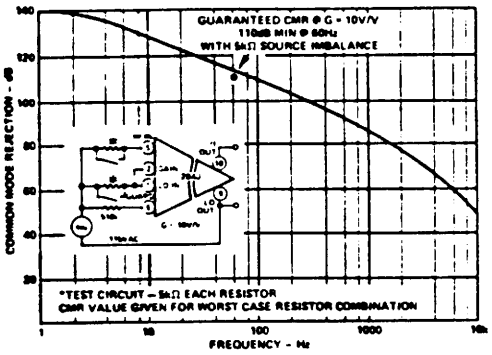


Figure 6. Common Mode Rejection vs. Frequency

Figure 7 illustrates the effect of source imbalance on CMR performance at 60Hz and Gain = 10V/V. CMR is typically 120dB at 60Hz and a balanced source. CMR is maintained greater than 80dB for source imbalances up to 100kΩ.

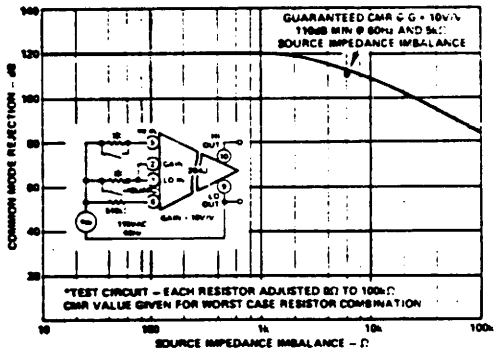


Figure 7. Common Mode Rejection vs. Source Impedance Imbalance

Input Voltage Noise: Voltage noise, referred to input, is dependent on gain and bandwidth as illustrated in Figure 8. RMS voltage noise is shown in a bandwidth from 0.05Hz to the frequency shown on the horizontal axis. The noise in a bandwidth from 0.05Hz to 100Hz is 8μV pk-pk at a gain of 10V/V. This value is derived by multiplying the rms value at f = 100Hz shown in Figure 8 (1.2μV rms) by 6.6.

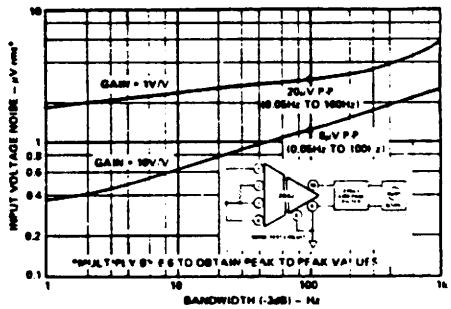


Figure 8. Input Voltage Noise vs. Bandwidth

For lowest noise performance, a low pass filter at the output should be used to selectively roll-off noise, output ripple and undesired signal frequencies beyond the bandwidth of interest (see note 3, Figure 1).

Input Offset Voltage Drift: Total input voltage drift is composed of two sources, input and output stage drifts and is gain dependent. The curve of Figure 9 illustrates the total input voltage drift over the gain range of 1 to 10V/V.

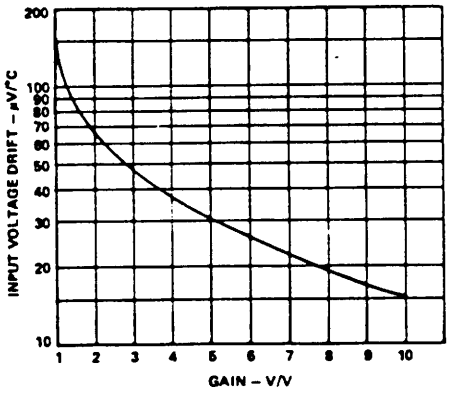
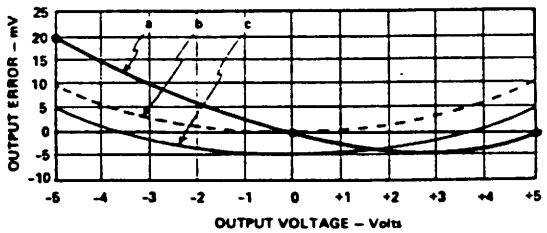


Figure 9. Input Offset Voltage Drift vs. Gain

Gain Nonlinearity: Linearity error is defined as the peak deviation of the output voltage from the best straight line and is specified as a % of peak-to-peak output voltage span; e.g. nonlinearity of model 284J operating at an output span of 10V pk-pk (±5V) is ±0.05% or ±5mV. In applying model 284J, highest accuracy is achieved by adjustment of gain and offset voltage to minimize the peak error over the operating output voltage span. A calibration technique illustrating how to minimize output error is shown below. In this example, model 284J is operating over an output span of +5V to -5V and a gain of 5V/V.

GAIN AND OFFSET TRIM PROCEDURE

1. Apply e_{IN} = 0 volts and adjust R_O for e_O = 0 volts.
2. Apply e_{IN} = +1.000V dc and adjust R_G for e_O = +5.000V dc.
3. Apply e_{IN} = −1.000V dc and measure the output error (see curve a).
4. Adjust R_G until the output error is one half that measured in step 3 (see curve b).
5. Apply e_{IN} = +1.000V dc and adjust R_O until the output error is one half that measured in step 4 (see curve c).



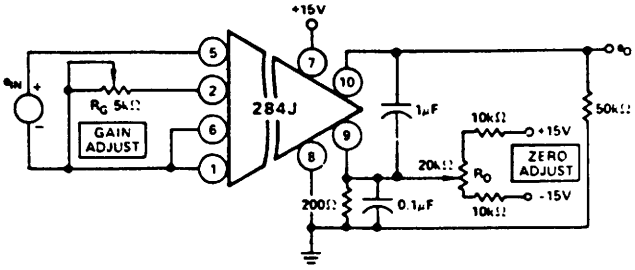


Figure 10. Gain and Offset Adjustment

GROUNDING PRACTICES

The more common sources of electrical noise arise from ground loops, electrostatic coupling and electromagnetic pickup. The guidelines listed below pertain to guarding low level, millivolt signals in hostile environments such as current shunt signals in "heavy industrial" plants.

Guidelines:

- Use twisted shielded cable to reduce inductive and capacitive pickup.
- Drive the transducer cable shield, S, with the common mode signal source, E_G, to reduce the effective cable capacitance as shown in Figure 11 below. This is accomplished by connecting the shield point S, as close as possible to the transducer signal low point B. This may not always be possible. In some cases the shield may be separated from signal low by a portion of the medium being measured (e.g. pressure transducer). This will cause a common mode signal, E_M, to be generated by the medium between the shield and the signal low. The 78dB CMR capability of model 284J between the input terminals (HI IN and LO IN) and GUARD, will work to suppress the common mode signal, E_M.
- To avoid ground loops and excessive hum, signal low, B, or the transducer cable shield, S, should never be grounded at more than one point.
- Dress unshielded leads short at the connection terminals and reduce the area formed by these leads to minimize inductive pickup.

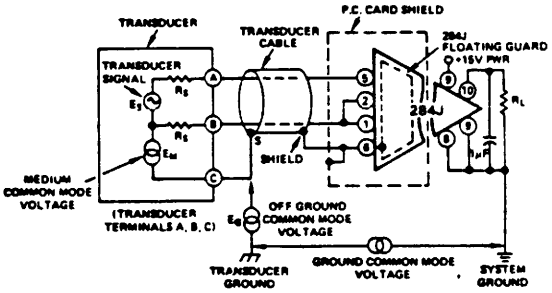


Figure 11. Transducer-Amplifier Interconnection

Isolated Power and Output Voltage Swing: Model 284J offers a floating power supply providing ±8.5V dc outputs with ±5mA output current rating. As shown in Figure 12, the minimum voltage output for $\pm V_{ISO}$, as well as the maximum load capability, is dependent on the input power supply, $+V_S$. Figure 12 also illustrates the typical output voltage range as both input supply, $+V_S$, and the isolated supply loads, $\pm I_L$, are varied. At ±5mA isolated load and V_S = +15V dc, model 284J can provide an output voltage swing of ±7.5V.

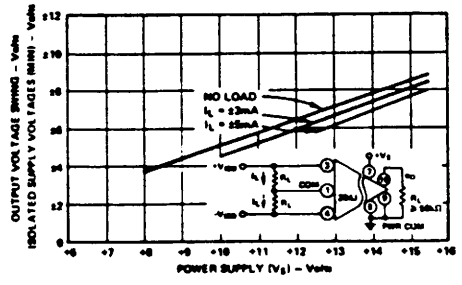


Figure 12. Isolated Power ($\pm V_{ISO}$) and Output Voltage Swing ($\pm E_O$) Versus Power Supply Input (V_S)

APPLICATIONS IN INDUSTRIAL MEASUREMENT AND CONTROL SYSTEMS

Remote Sensor Interface: In chemical, nuclear and metal processing industries, model 284J can be applied to measure and control off-ground millivolt signals in the presence of ±2500V dc CMV signals. In interface applications such as pH control systems of on-line process measurement systems such as pollution monitoring, model 284J offers complete galvanic isolation to eliminate troublesome ground loop problems. Isolated power outputs and adjustable gain add to the application flexibility of this model.

Figure 13 illustrates how model 284J can be combined with a low drift, 1μV/°C max, front-end amplifier, model AD510K, to interface low level transducer signals. Model 284J's isolated ±8.5V dc power and front-end guard eliminate ground loops and preserve high CMR (114dB @ 60Hz).

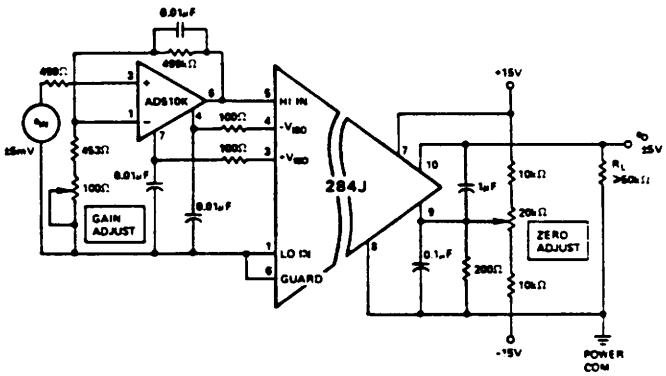


Figure 13. Input Signal Conditioning Using Isolated Power for Transducer Buffer Amplifier

Instrumentation Amplifier: Model 284J provides a floating guarded input stage capable of directly accepting isolated differential signals. The non-inverting, single-ended input stage offers simple two wire interconnection with floating input signals.

In applications where the isolated power is applied to transducers such as bridges which generate differential input signals with common mode voltages measured with respect to the isolated power common, model 284J can be connected as shown in Figure 14. To achieve high CMR with respect to the ISO PWR COM, the following trim procedure is recommended.

CMR Trim Procedure

1) Connect a 1V pk-pk oscillator between the +IN/-IN and IN COM terminals as shown in Figure 14.
2) Set the input frequency at 0.5Hz and adjust R1 for minimum e_O.
3) Set the input frequency at 60Hz and adjust R2 for minimum e_O.
4) Repeat steps 2 and 3 for best CMR performance.

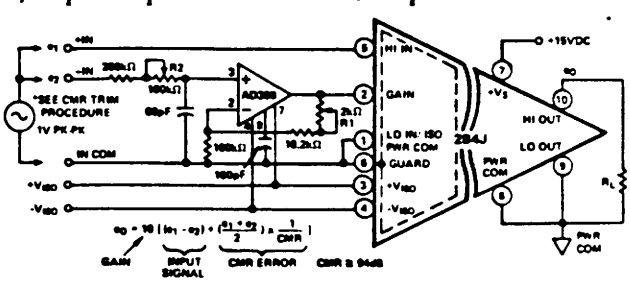
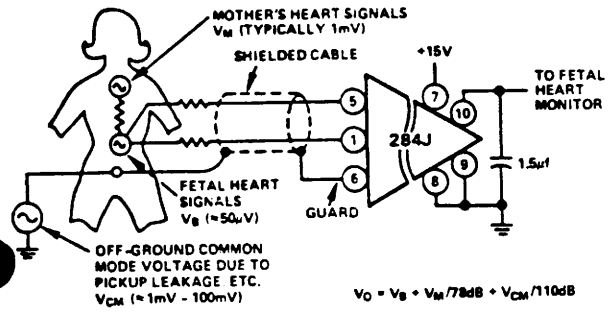


Figure 14. Application of 284J as Instrumentation Amplifier

APPLICATIONS IN BIOMEDICAL DESIGNS

Cardiac Monitoring: Heart signals can be masked by muscle noise, electrochemical noise, residual electrode voltages and 60Hz power line pickup. To achieve high performance in cardiac monitoring, model 284J's design provides high CMR in the dc to 100Hz bandwidth and substantial source impedance — to 5kΩ. An especially demanding ECG requirement is that of fetal heart monitoring as illustrated in Figure 15. The low input noise of model 284J and the dual CMR ratings are exploited in this application to extract the fetal ECG signals. The separation between the mother's and the fetal heartbeat is enhanced by the 78dB of CMR between the input electrodes and guard, while the 110dB of CMR from input to output ground screens out 60Hz pickup and other external interference.



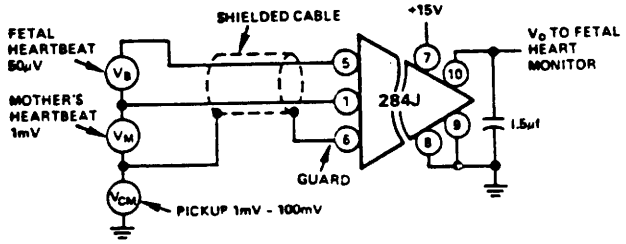


Figure 15. Fetal Heartbeat Monitoring

Single Lead ECG Recorder with Leads Off Indicator: In single lead applications model 284J offers simple two-wire hook-up to the ECG signal as illustrated in Figure 16. The floating signal can be connected directly to the HI IN and LO IN terminals using the GUARD tied to the patients' right leg for best CMR performance. Using the isolated power from model 284J an inexpensive calibration signal is easily provided. In ECG applications, model 284J provides a simple means to determine whenever a "Leads-Off" condition exists at the input. A "Leads-Off" condition ($R_S = \infty$) will cause the HI OUT terminal to be at a negative output saturation level; i.e. e_O = -8.5V to -9.5V @ V_S = +15V.

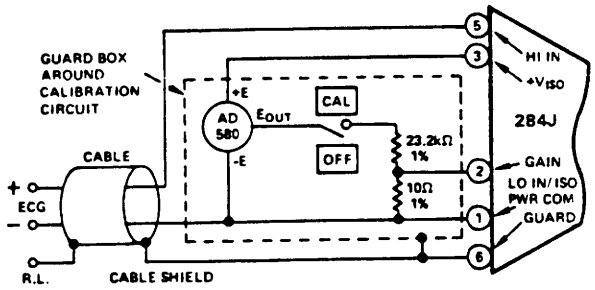


Figure 16. Single Lead ECG Recorder with 1mV Calibration Circuit and Leads Off Indicator

Multi-Lead ECG Recorder with Right Leg Drive: The small size, economy and isolated power makes model 284J an ideal isolation amplifier for application in clinical ECG recorders. Figure 17 illustrates how this new isolator can be applied in a high performance, portable multi-lead ECG recorder. In this application, model 284J's input is configured as an instrumentation amplifier with high CMR to the floating input common. The right leg drive offers improved CMR between input and isolated common by driving to zero any CMV existing between these points. The isolated power, $\pm V_{ISO}$, is used to drive the lead buffer amplifiers and the front-end, 1mV calibration signal.

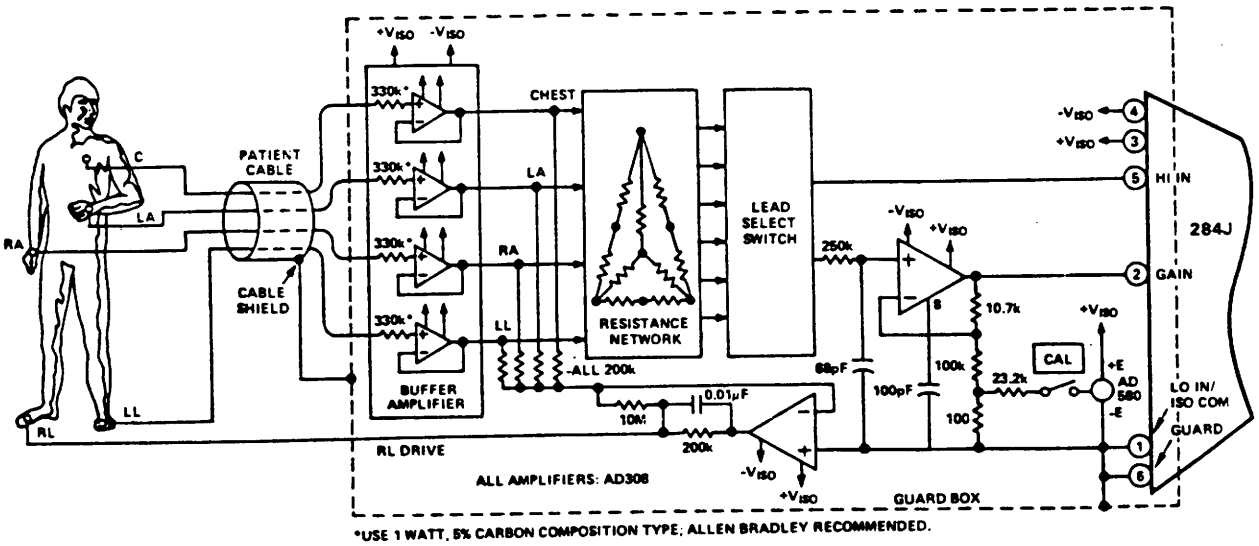


Figure 17. Multi-Lead ECG Recorder Application Using Model 284J with Right Leg Drive Output

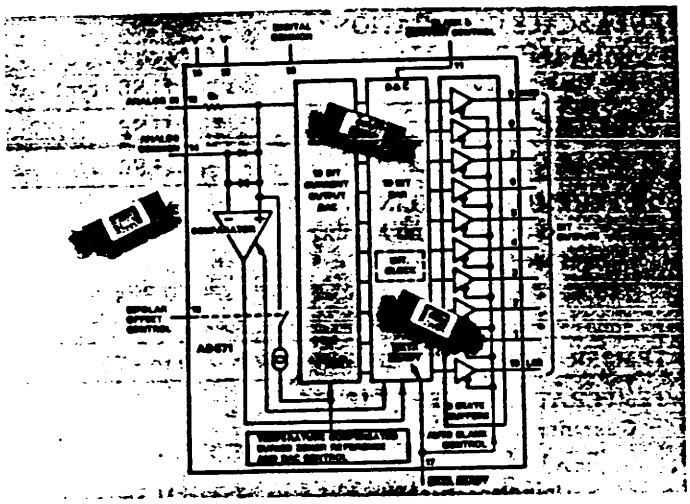
ANALOG DEVICES

Integrated Circuit 10-Bit Analog to Digital Converter

AD571

FEATURES

- Complete A/D Converter with Reference and Clock
- Fast Successive Approximation Conversion – 25μs
- No Missing Codes Over Temperature
  - 0 to +70°C – AD571K
  - -55°C to +125°C – AD571S
- Digital Multiplexing – 3 State Outputs
- 18 Pin Ceramic DIP
- Low Cost Monolithic Construction



PRODUCT DESCRIPTION

The AD571 is a 10-bit successive approximation A/D converter consisting of a DAC, voltage reference, clock, comparator, successive approximation register and output buffers – all fabricated on a single chip. No external components are required to perform a full accuracy 10-bit conversion in 25μs.

The AD571 incorporates the most advanced integrated circuit design and processing technology available today. It is the first complete converter to employ I^2L (integrated injection logic) processing in the fabrication of the SAR function. Laser trimming of the high stability SiCr thin film resistor ladder network at the wafer stage (LWT) insures high accuracy, which is maintained with a temperature compensated, subsurface Zener reference.

Operating on supplies of +5V to +15V and -15V, the AD571 will accept analog inputs of 0 to +10V, unipolar or ±5V bipolar, externally selectable. As the BLANK and $\overline{\text{CONVERT}}$ input is driven low, the three state outputs will be open and a conversion will commence. Upon completion of the conversion, the $\overline{\text{DATA READY}}$ line will go low and the data will appear at the output. Pulling the BLANK and $\overline{\text{CONVERT}}$ input high blanks the outputs and readies the device for the next conversion. The AD571 executes a true 10-bit conversion with no missing codes in approximately 25μs.

The AD571 is available in two versions for the 0 to +70°C temperature range, the AD571J and K. The AD571S guarantees 10-bit accuracy and no missing codes from -55°C to +125°C. All three grades are packaged in an 18-pin hermetically-sealed ceramic DIP.

*Covered by Patent No. 3,940,760, other patents pending.

PRODUCT HIGHLIGHTS

1. The AD571 is a complete 10-bit A/D converter. No external components are required to perform a conversion. Full scale calibration accuracy of ±0.3% is achieved without external trims.
2. The AD571 is a single chip device employing the most advanced IC processing techniques. Thus, the user has at his disposal a truly precision component with the reliability and low cost inherent in monolithic construction.
3. The AD571 accepts either unipolar (0 to +10V) or bipolar (-5V to +5V) analog inputs by simply grounding or opening a single pin.
4. The device offers true 10-bit accuracy and exhibits no missing codes over its entire operating temperature range.
5. Operation is guaranteed with -15V and +5V to +15V supplies. The device will also operate with a -12V supply.
6. The AD571S is also available with full processing to MIL-STD-883A, Class B. The single chip construction and functional completeness make the AD571 especially attractive for high reliability applications.
7. Every AD571 is subjected to long-term stabilization bakes, given a powered burn-in at +125°C, and temperature cycled ten times from -65°C to +150°C prior to final test to insure reliability and long-term stability. In addition, all units are tested 100% at the extremes of their respective temperature ranges for all parameters to guarantee full performance.

SPECIFICATIONS

(typical @ +25°C with V+ = +5V, V- = -15V, all voltages measured with respect to digital common, unless otherwise indicated)

MODEL	AD571JD	AD571KD	AD571SD/AD571SD-883B[5]
RESOLUTION	10 Bits	•	•
RELATIVE ACCURACY @ 25°C[1]	±1LSB max	±1/2LSB max	±1LSB max
T_{min} to T_{max}	±1LSB max	±1/2LSB max	±1LSB max
FULL SCALE CALIBRATION[2] (With 15Ω Resistor In Series With Analog Input	±2LSB (typ)	•	•
UNIPOLAR OFFSET (max)	±1LSB	±1/2LSB	•
BIPOLAR OFFSET (max)	±1LSB	±1/2LSB	•
DIFFERENTIAL NONLINEARITY (Resolution for Which no Missing Codes are Guaranteed)			
+25°C	10 Bits	•	•
T_{min} to T_{max}	9 Bits	10 Bits	10 Bits
TEMPERATURE RANGE	0 to +70°C	•	-55°C to +125°C
TEMPERATURE COEFFICIENTS			
Guaranteed max Change			
T_{min} to T_{max}			
Unipolar Offset	±2LSB (44ppm/°C)	±1LSB (22ppm/°C)	±2LSB (20ppm/°C)
Bipolar Offset	±2LSB (44ppm/°C)	±1LSB (22ppm/°C)	±2LSB (20ppm/°C)
Full Scale Calibration (With 15Ω Fixed Resistor or 50Ω Trimmer)	±4LSB (88ppm/°C)	±2LSB (44ppm/°C)	±5LSB (50ppm/°C)
POWER SUPPLY REJECTION			
Max Change In Full Scale Calibration			
CMOS Positive Supply (K only)			
+13.5V≤V+≤+16.5V	N.A.	±1LSB max	N.A.
TTL Positive Supply			
+4.5V≤V+≤+5.5V	±2LSB max	±1LSB max	•
Negative Supply			
-16.5V≤V+≤-13.5V	±2LSB max	±1LSB max	•
ANALOG INPUT RESISTANCE	3kΩ min	•	•
	5kΩ typ	•	•
	7kΩ max	•	•
ANALOG INPUT RANGES			
(Analog Input to Analog Common)			
Unipolar	0 to +10V	•	•
Bipolar	-5V to +5V	•	•
OUTPUT CODING			
Unipolar	Positive True Binary	•	•
Bipolar	Positive True Offset Binary	•	•
LOGIC OUTPUT[3]			
Bit Outputs and $\overline{Data\ Ready}$			
Output Sink Current	3.2mA min	•	•
(V_{OUT} = 0.4V max, T_{min} to T_{max})	(2TTL Loads)	•	•
Output Source Current (Bit Outputs)[4]			
(V_{OUT} = 2.4V min, T_{min} to T_{max})	0.5mA min	•	•
Output Leakage When Blanked	±40μA max	•	•
LOGIC INPUT			
Blank and Convert Input			
0≤V_{in}≤V+	±40μA max	•	•
Blank – Logic "1"	2.0V min	•	•
Convert – Logic "0"	0.8V max	•	•
CONVERSION TIME	15μs min	•	•
	25μs typ	•	•
	30μs max	•	•

MODEL	AD571JD	AD571KD	AD571SD/AD571SD-883B[5]
POWER SUPPLY			
Absolute Maximum			
V+	+7V	+16.5V	*
V-	-16.5V	*	*
Specified Operating – Rated Performance			
V+	+5V	+5V to +15V	*
V-	-15V	*	*
Operating Range			
V+	+4.5V to +5.5V	+4.5V to +16.5V	*
V-	-12V to -16.5V	*	*
Operating Current			
Blank Mode			
V+ = +5V	2mA typ (10mA max)	*	*
V+ = +15V	5mA typ (10mA max)	*	*
V- = -15V	9mA typ (15mA max)	*	*
Convert Mode			
V+ = +5V	5mA	*	*
V+ = +15V	10mA	*	*
V- = -15V	10mA	*	*

*Specifications same as AD571J
**Specifications same as AD571K
Specifications subject to change without notice.

NOTES:
[1] Relative accuracy is defined as the deviation of the code transition points from the ideal transfer point on a straight line from the zero to the full scale of the device.
[2] Full scale calibration is guaranteed trimmable to zero with an external 50Ω potentiometer in place of the 15Ω fixed resistor. Full scale is defined as 10 volts minus 1LSB, or 9.990 volts.
[3] Logic Input and Output Thresholds and Levels are a function of V+. They are guaranteed TTL compatible at V+ = +5V, CMOS compatible at V+ = 15V for the AD571K.
[4] The Data output lines have active pull-ups to source 0.5mA. The $\overline{\text{DATA READY}}$ line is open collector with a nominal 6kΩ internal pull-up resistor.
[5] The AD571S is available fully processed and screened to the requirements of MIL-STD-883A, Class B. A complete list of tests is given further. When ordering, specify the AD571SD-883B.

ABSOLUTE MAXIMUM RATINGS

V+ to Digital Common AD571J, S . . . . . .0 to +7V
AD571K. . . . . 0 to +16.5V
V- to Digital Common . . . . . .0 to -16.5V
Analog Common to Digital Common. . . . . .±1V
Analog Input to Analog Common. . . . . ±15V
Control Inputs . . . . . 0 to V+
Digital Outputs (Blank Mode). . . . . .0 to V+
Power Dissipation. 800mW

OUTLINE DIMENSIONS

Dimensions shown in inches and (mm).

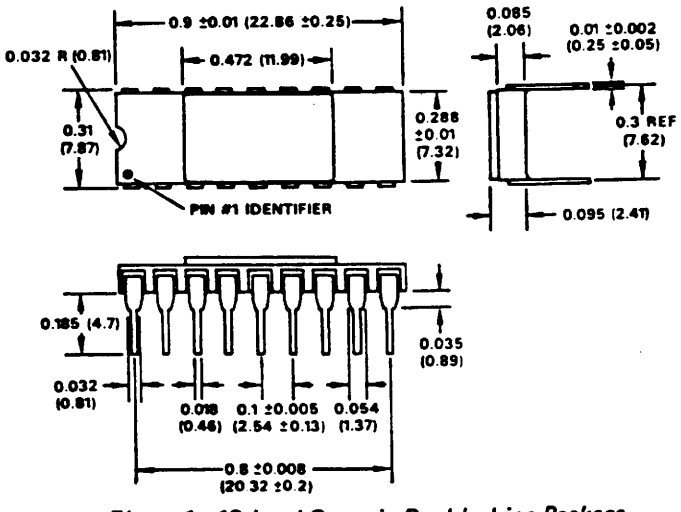


Figure 1. 18-Lead Ceramic Dual-In-Line Package

'RCUIT DESCRIPTION

e AD571 is a complete 10-bit A/D converter which requires no external components to provide the complete successive-approximation analog-to-digital conversion function. A block diagram of the AD571 is shown in Figure 2. Upon receipt of the $\overline{\text{CONVERT}}$ command, the internal 10-bit current output DAC is sequenced by the I^2L successive-approximation register (SAR) from its most-significant bit (MSB) to least-significant bit (LSB) to provide an output current which accurately balances the input signal current through the 5kΩ input resistor. The comparator determines whether the addition of each successively-weighted bit current causes the DAC current sum to be greater or less than the input current; if the sum is less the bit is left on, if more, the bit is turned off. After testing all the bits, the SAR contains a 10-bit binary code which accurately represents the input signal to within ±½LSB (0.05%).

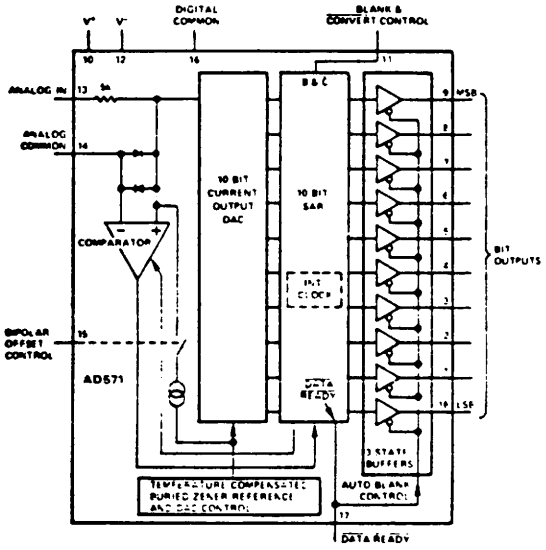


Figure 2. AD571 Functional Block Diagram

Upon completion of the sequence, the SAR sends out a "DATA $\overline{\text{READY}}$ signal (active low), which also brings the three-state buffers out of their "open" state, making the bit output lines become active high or low, depending on the code in the SAR. When the BLANK and $\overline{\text{CONVERT}}$ line is brought high, the output buffers again go "open", and the SAR is prepared for another conversion cycle. Details of the timing are given further.

The temperature compensated buried Zener reference provides the primary voltage reference to the DAC and guarantees excellent stability with both time and temperature. The bipolar offset input controls a switch which allows the positive bipolar offset current (exactly equal to the value of the MSB less ½LSB) to be injected into the summing (+) node of the comparator to offset the DAC output. Thus the nominal 0 to +10V unipolar input range becomes a −5V to +5V range. The 5kΩ thin film input resistor is trimmed so that with a full scale input signal, an input current will be generated which exactly matches the DAC output with all bits on. (The input resistor is trimmed slightly low to facilitate user trimming, as discussed on the next page.)

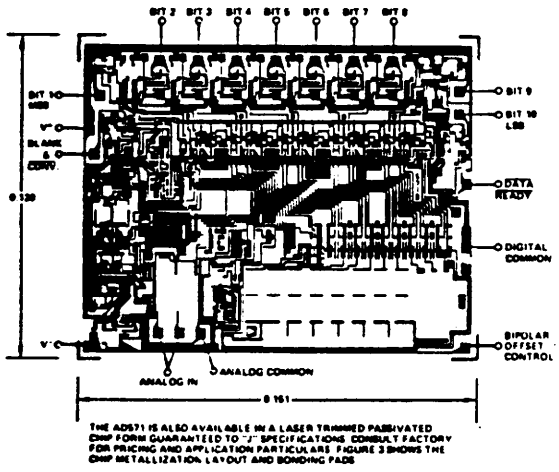


Figure 3. Chip Bonding Diagram

POWER SUPPLY SELECTION

The AD571 is designed for optimum performance using a +5V and −15V supply, for which the AD571J and AD571S are specified. AD571K will also operate with up to a +15V supply, which allows direct interface to CMOS logic. The input logic threshold is a function of V+ as shown in Figure 4. The supply current drawn by the device is a function of both V+ and the operating mode (BLANK or CONVERT). These supply current variations are shown in Figure 5. The supply currents change only moderately over temperature as shown in Figure 9.

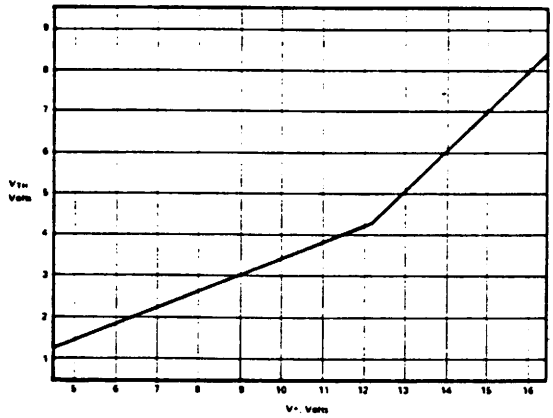


Figure 4. Logic Threshold (AD571K Only)

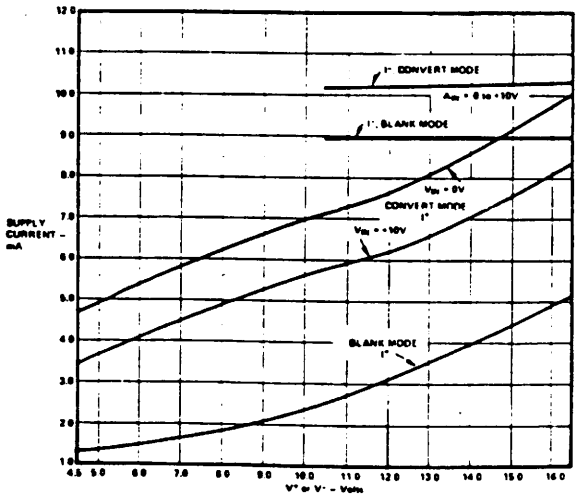


Figure 5. Supply Currents vs Supply Levels and Operating Modes

CONNECTING THE AD571 FOR STANDARD OPERATION

The AD571 contains all the active components required to perform a complete A/D conversion. Thus, for most situations, all that is necessary is connection of the power supply (+5 and -15), the analog input, and the conversion start pulse. But, there are some features and special connections which should be considered for achieving optimum performance. The functional pin-out is shown in Figure 6.

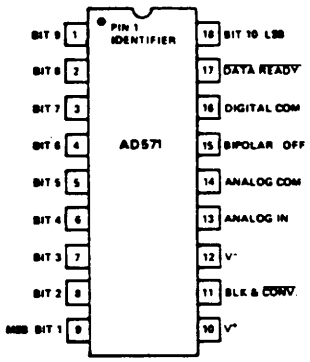


Figure 6. AD571 Pin Connections

FULL SCALE CALIBRATION

The 5kΩ thin film input resistor is laser trimmed to produce a current which matches the full scale current of the internal DAC—plus about 0.3%—when a full scale analog input voltage of 9.990 volts (10 volts − 1LSB) is applied at the input. The input resistor is trimmed in this way so that if a fine trimming potentiometer is inserted in series with the input signal, the input current at the full scale input voltage can be trimmed down to match the DAC full scale current as precisely as desired. However, for many applications the nominal 9.99 volt full scale can be achieved to sufficient accuracy by simply inserting a 15Ω resistor in series with the analog input to pin 13. Typical full scale calibration error will then be about ±2LSB or ±0.2%. If the more precise calibration is desired, a 50Ω trimmer should be used instead. Set the analog input at 9.990 volts, and set the trimmer so that the output code is just at the transition between 1111111110 and 1111111111. Each LSB will then have a weight of 9.766mV. If a nominal full scale of 10.24 volts is desired (which makes the LSB have weight of exactly 10.00mV), a 100Ω resistor in series with a 100Ω trimmer (or a 200Ω trimmer with good resolution) should be used. Of course, larger full scale ranges can be arranged by using a larger input resistor, but linearity and full scale temperature coefficient may be compromised if the external resistor becomes a sizeable percentage of 5kΩ.

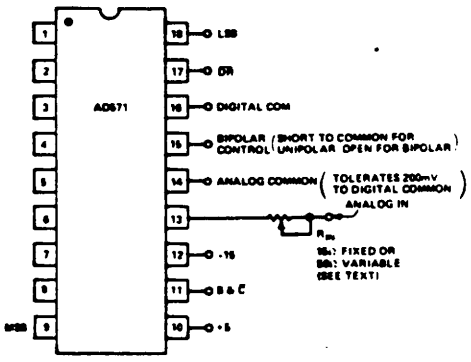


Figure 7. Standard AD571 Connections

BIPOLAR OPERATION

The standard unipolar 0 to +10V range is obtained by shorting the bipolar offset control pin to digital common. If the pin is left open, the bipolar offset current will be switched into the comparator summing node, giving a -5V to +5V range with an offset binary output code. (-5.00 volts in will give a 10-bit code of 0000000000; an input of 0.00 volts results in an output code of 1000000000 and 4.99 volts at the input yeilds the 1111111111 code). The bipolar offset control input is not directly TTL compatible, but a TTL interface for logic control can be constructed as shown in Figure 8.

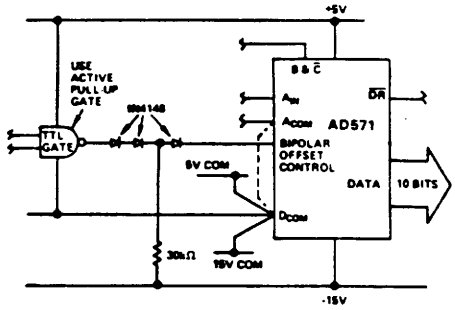


Figure 8. Bipolar Offset Controlled by Logic Gate

Gate Output = 1 Unipolar 0 - 10V Input Range
Gate Output = 0 Bipolar ±5V Input Range

COMMON MODE RANGE

The AD571 provides separate Analog and Digital Common connections. The circuit will operate properly with as much as ±200mV of common mode range between the two commons. This permits more flexible control of system common bussing and digital and analog returns.

In normal operation the Analog Common terminal may generate transient currents of up to 2mA during a conversion. In addition, a static current of about 2mA will flow into Analog Common in the unipolar mode after a conversion is complete. An additional 1mA will flow in during a blank interval with zero analog input. The Analog Common current will be modulated by the variations in input signal.

The absolute maximum voltage rating between the two commons is ±1 volt. We recommend the connection of a parallel pair of back-to-back protection diodes between the commons if they are not connected locally.

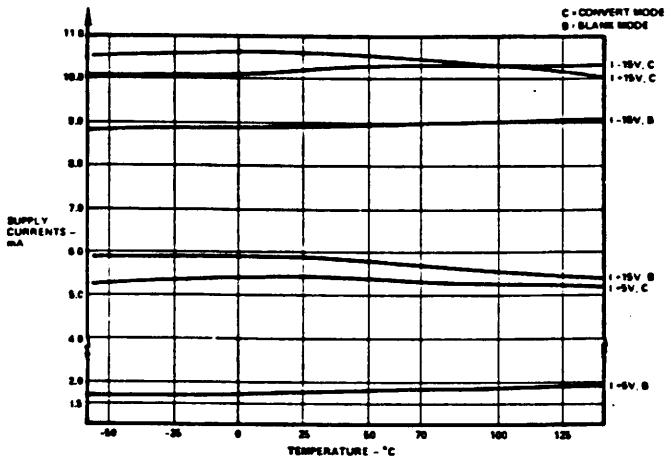
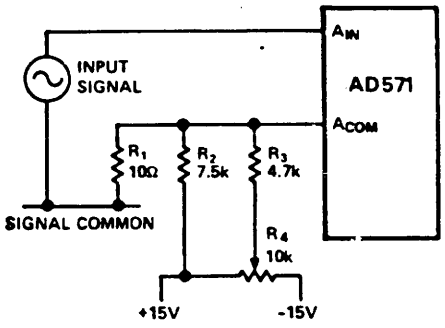


Figure 9. AD571 Power Supply Current vs Temperature

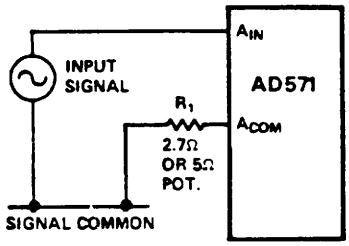
ZERO OFFSET

The apparent zero point of the AD571 can be adjusted by inserting an offset voltage between the Analog Common of the device and the actual signal return or signal common. Figure 10 illustrates two methods of providing this offset. Figure 10A shows how the converter zero may be offset by up to ±3 bits to correct the device initial offset and/or input signal offsets. As shown, the circuit gives approximately symmetrical adjustment in unipolar mode. In bipolar mode R2 should be omitted to obtain a symmetrical range.



ZERO OFFSET ADJ
±3 BIT RANGE

Figure 10.(A)

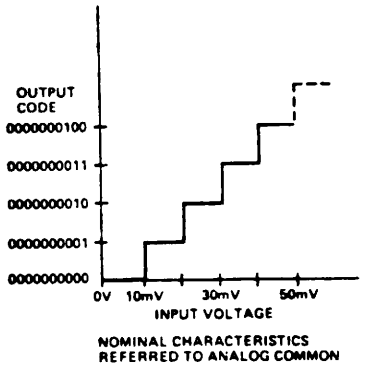


½ BIT ZERO OFFSET

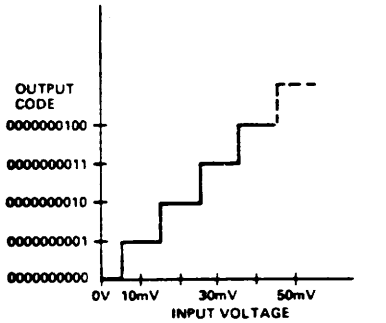
Figure 10.(B)

Figure 11 shows the nominal transfer curve near zero for an AD571 in unipolar mode. The code transitions are at the edges of the nominal bit weights. In some applications it will be preferable to offset the code transitions so that they fall between the nominal bit weights, as shown in the offset characteristics. This offset can easily be accomplished as shown in Figure 10B. At balance (after a conversion) approximately 2mA flows into the Analog Common terminal. A 2.7Ω resistor in series with this terminal will result in approximately the desired ½ bit offset of the transfer characteristics. The nominal 2mA Analog Common current is not closely controlled in manufacture. If high accuracy is required, a 5Ω potentiometer (connected as a rheostat) can be used as R2. Additional negative offset range may be obtained by using larger values of R2. Of course, if the zero transition point is changed, the full scale transition point will also move. Thus, if an offset of ½LSB is introduced, full scale trimming as described on previous page should be done with an analog input of 9.985 volts.

NOTE: During a conversion transient currents from the Analog Common terminal will disturb the offset voltage. Capacitive decoupling should not be used around the offset network. These transients will settle as appropriate during a conversion. Capacitive decoupling will "pump up" and fail to settle resulting in conversion errors. Power supply decoupling which returns to analog signal common, should go to the signal input side of the resistive offset network.



NOMINAL CHARACTERISTICS
REFERRED TO ANALOG COMMON



OFFSET CHARACTERISTICS WITH
2.7Ω IN SERIES WITH ANALOG COMMON

Figure 11. AD571 Transfer Curve - Unipolar Operation (Approximate Bit Weights Shown for Illustration, Nominal Bit Weights ~ 9.766mV)

MIL-STD-883

The rigors of the military/aerospace environment, temperature extremes, humidity, mechanical stress, etc., demand the utmost in electronic circuits. The AD571, with the inherent reliability of integrated circuit construction, was designed with these applications in mind. The hermetically-sealed, low profile DIP package takes up a fraction of the space required by equivalent modular designs and protects the chip from hazardous environments. To further insure reliability, the AD571 is offered with 100% screening to MIL-STD-883B, method 5004.

Table I details the test procedures of MIL-STD-883. Analog Devices subjects each part ordered with 883B screening to these tests on a 100% basis.

TABLE I

TEST	METHOD
1) Internal Visual (Pre cap)	2010, Test Condition B
2) Stabilization Bake	Method 1008, 24 hours @ +150°C
3) Temperature Cycling	Method 1010, Test Condition C, 10 Cycles, -65°C to +150°C
4) Constant Acceleration	Method 2001, Test Condition E, Y1 plane, 30kg
5) Seal, Fine and Gross	Method 1014, Test Condition A and C
6) Burn-in Test	Method 1015, Test Condition B, 168 hours @ +125°C
7) Final Electrical Tests	Performed 100% to all min and max specifications on data pages
8) External Visual	Method 2009

CONTROL AND TIMING OF THE AD571

There are several important timing and control features on the AD571 which must be understood precisely to allow optimal interfacing to microprocessor or other types of control systems. All of these features are shown in the timing diagram in Figure 12.

The normal stand-by situation is shown at the left end of the drawing. The BLANK and $\overline{\text{CONVERT}}$ (B & $\overline{\text{C}}$) line is held high, the output lines will be "open", and the $\overline{\text{DATA READY}}$ ($\overline{\text{DR}}$) line will be high. This mode is the lowest power state of the device (typically 150mW). When the (B & $\overline{\text{C}}$) line is brought low, the conversion cycle is initiated; but the $\overline{\text{DR}}$ and Data lines do not change state. When the conversion cycle is complete (typically 25μs), the $\overline{\text{DR}}$ line goes low, and within 500ns, the Data lines become active with the new data.

About 1.5μs after the B & $\overline{\text{C}}$ line is again brought high, the $\overline{\text{DR}}$ line will go high and the Data lines will go open. When the B & $\overline{\text{C}}$ line is again brought low, a new conversion will begin. The minimum pulse width for the B & $\overline{\text{C}}$ line to blank previous data and start a new conversion is 2μs. If the B & $\overline{\text{C}}$ line is brought high during a conversion, the conversion will stop, and the $\overline{\text{DR}}$ and Data lines will not change. If a 2μs or longer pulse is applied to the B & C line during a conversion, the converter will clear and start a new conversion cycle.

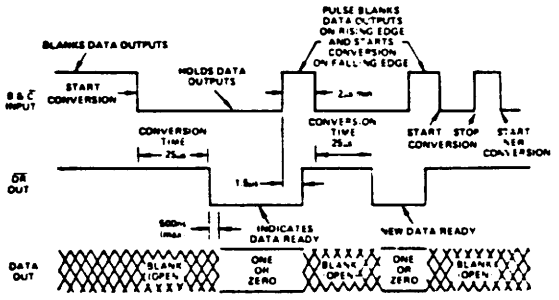


Figure 12. AD571 Timing and Control Sequence

CONTROL MODES WITH BLANK AND $\overline{\text{CONVERT}}$

The timing sequence of the AD571 discussed above allows the device to be easily operated in a variety of systems with differing control modes. The two most common control modes, the Convert Pulse Mode, and the Multiplex Mode, are illustrated here.

Convert Pulse Mode — In this mode, data is present at the output of the converter at all times except when conversion is taking place. Figure 13 illustrates the timing of this mode. The BLANK and $\overline{\text{CONVERT}}$ line is normally low and conversions are triggered by a positive pulse. A typical application for this timing mode is shown in Figure 16, in which μP bus interfacing is easily accomplished with three-state buffers.

Multiplex Mode — In this mode the outputs are blanked except when the device is selected for conversion and readout; this timing shown in Figure 14. A typical AD571 multiplexing application is shown in Figure 17.

This operating mode allows multiple AD571 devices to drive common data lines. All BLANK and $\overline{\text{CONVERT}}$ lines are held high to keep the outputs blanked. A single AD571 is selected, its BLANK and $\overline{\text{CONVERT}}$ line is driven low and at the end of conversion, which is indicated by $\overline{\text{DATA READY}}$ going low, the conversion result will be present at the outputs. When this data has been read from the 10-bit bus, BLANK and $\overline{\text{CONVERT}}$ is restored to the blank mode to clear the data bus for other converters. When several AD571's are multiplexed in sequence, a new conversion may be started in one AD571 while data is being read from another. As long as the data is read and the first AD571 is cleared within 15μs after the start of conversion of the second AD571, no data overlap will occur.

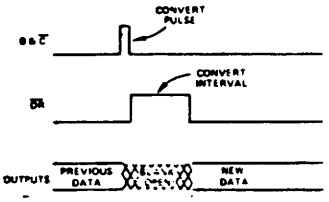


Figure 13. Convert Pulse Mode

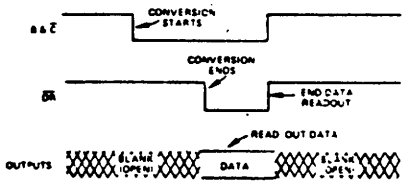


Figure 14. Multiplex Mode

SAMPLE-HOLD AMPLIFIER CONNECTION TO THE AD571

Many situations in high-speed acquisition systems or digitizing of rapidly changing signals require a sample-hold amplifier (SHA) in front of the A-D converter. The SHA can acquire and hold a signal faster than the converter can perform a conversion. A SHA can also be used to accurately define the exact point in time at which the signal is sampled. For the AD571, a SHA can also serve as a high input impedance buffer.

Figure 15 shows the AD571 connected to the AD582 monolithic SHA for high speed signal acquisition. In this configuration, the AD582 will acquire a 10 volt signal in less than 10μs with a droop rate less than 100μV/ms. The control signals are arranged so that when the control line goes low, the AD582 is put into the "hold" mode, and the AD571 will begin its conversion cycle. (The AD582 settles to final value well in advance of the

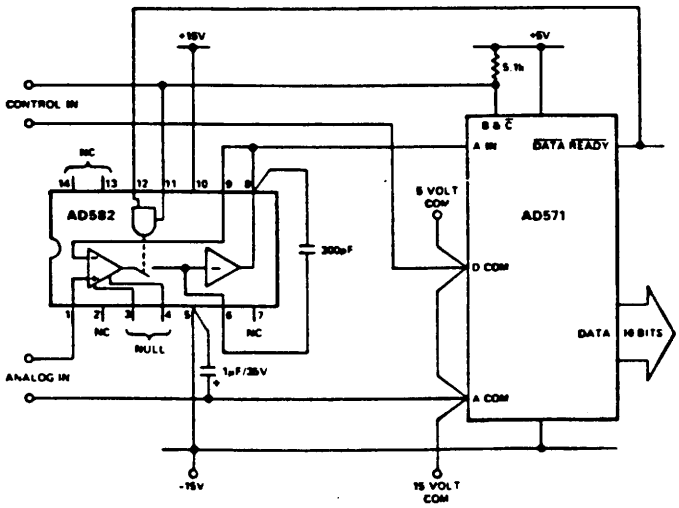


Figure 15. Sample-Hold Interface to the AD571

first comparator decision inside the AD571). The $\overline{\text{DATA READY}}$ line is fed back to the other side of the differential input control gate so that the AD582 cannot come out of the "hold" mode during the conversion cycle. At the end of the conversion cycle, the $\overline{\text{DATA READY}}$ line goes low, automatically placing the AD582 back into the sample mode. This feature allows simple control of both the SHA and the A-D converter with a single line. Observe carefully the ground, supply, and bypass capacitor connections between the two devices. This will minimize ground noise and interference during the conversion cycle to give the most accurate measurements.

INTERFACING THE AD571 TO A MICROPROCESSOR

The AD571 can easily be arranged to be driven from standard microprocessor control lines and to present data to any standard microprocessor bus (4-, 8-, 12-or 16-bit) with a minimum of additional control components. The configuration shown in Figure 16 is designed to operate with an 8-bit bus and standard 8080 control signals.

The input control circuitry shown is required to insure that the AD571 receives a sufficiently long B & $\overline{\text{C}}$ input pulse. When the converter is ready to start a new conversion, the B & $\overline{\text{C}}$ line is low, and $\overline{\text{DR}}$ is low. To command a conversion, the start address decode line goes low, followed by $\overline{\text{WR}}$. The B & $\overline{\text{C}}$ line will now go high, followed about 1.5μs later by $\overline{\text{DR}}$. This resets the external flip-flop and brings B & $\overline{\text{C}}$ back to low, which initiates the conversion cycle. At the end of the conversion cycle, the $\overline{\text{DR}}$ line goes low, the data outputs will become active with the new data and the control lines will return to the stand-by state. The new data will remain active until a new conversion is commanded. The self-pulsing nature of this circuit guarantees a sufficient convert pulse width.

This new data can now be presented to the data bus by enabling the three-state buffers when desired. A data word (8-bit or 2-bit) is loaded onto the bus when its decoded address goes low and the $\overline{\text{RD}}$ line goes low. This arrangement presents data to the bus "left-justified," with highest bits in the 8-bit word; a "right-justified" data arrangement can be set up by a simple re-wiring. Polling the converter to determine if conversion is complete can be done by addressing the gate which buffers the $\overline{\text{DR}}$ line, as shown. In this configuration, there is no need for additional buffer register storage since the data can be held indefinitely in the AD571, since the B & $\overline{\text{C}}$ line is continually held low.

BUS INTERFACING WITH A PERIPHERAL INTERFACE CIRCUIT

An improved technique for interfacing to a μP bus involves the use of special peripheral interfacing circuits (or I/O devices), such as the MC6820 Peripheral Interface Adapter (PIA). Shown in Figure 17 is a straightforward application of a PIA to multiplex up to 8 AD571 circuits. The AD571 has 3-state outputs, hence the data bit outputs can be paralleled, provided that only one converter at a time is permitted to be the active state. The $\overline{\text{DATA READY}}$ output of the AD571 is an open collector with resistor pull-up, thus several $\overline{\text{DR}}$ lines can be wire-ored to allow indication of the status of the selected device. One of the 8-bit ports of the PIA is combined with 2-bits from the other port and programmed as a 10-bit input port. The remaining 6-bits of the second port are programmed as outputs and along with the 2 control bits (which act as outputs), are used to control the 8 AD571's. When a control line is in the "1" or high state, the ADC will be automatically blanked. That is, its outputs will be in the inactive open state. If a single control line is switched low, its ADC will convert and the outputs will automatically go active when the conversion is complete. The result can be read from the two peripheral ports; when the next conversion is desired, a different control line can be switched to zero, blanking the previously active port at the same time. Subsequently, this second device can be read by the microprocessor, and so-forth. The status lines are wire-ored in 2 groups and connected to the two remaining control pins. This allows a conversion status check to be made after a convert command, if necessary. The ADC's are divided into two groups to minimize the loading effect of the internal pull-up resistors on the $\overline{\text{DATA READY}}$ buffers. See the MC6820 data sheet for more application detail.

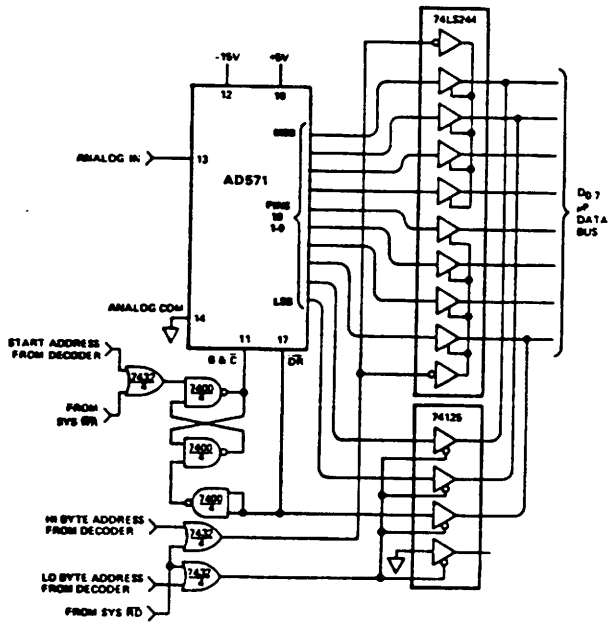


Figure 16. Interfacing AD571 to an 8-Bit Bus (8080 Control Structure)

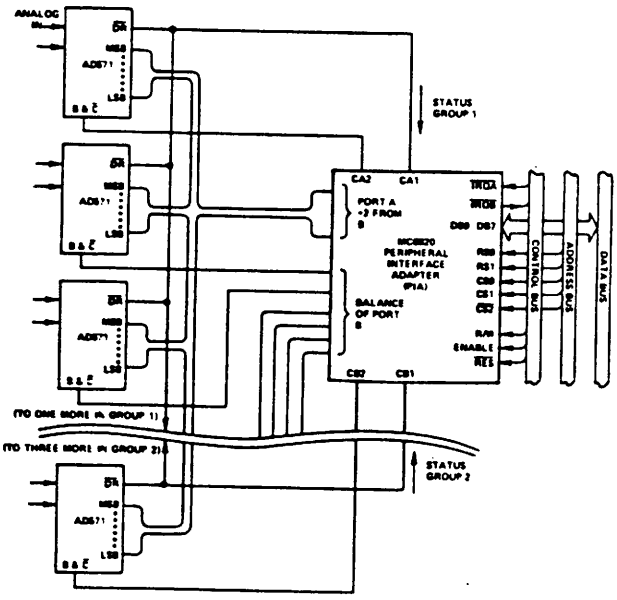


Figure 17. Multiplexing 8 AD571's Using Single PIA for μP Interface. No Other Logic Required (6800 Control Structure)

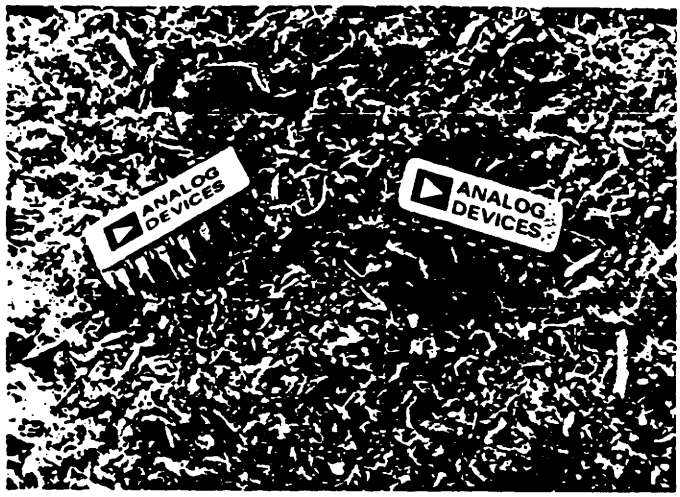
ANALOG DEVICES

IC Sample and Hold Gated Op Amp

AD583

FEATURES

- High Sample-to-Hold Current Ratio: 10^6
- High Slew Rate: 5V/μs
- High Bandwidth: 2MHz
- Low Aperture Time: 50ns
- Low Charge Transfer: 10pC
- DTL/TTL Compatible
- May Be Used as Gated Op Amp

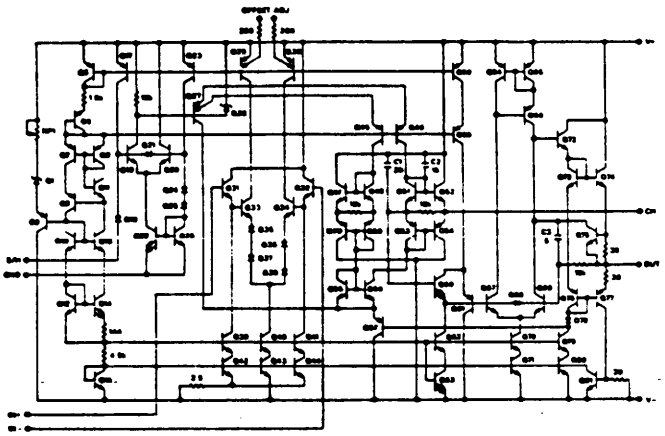


PRODUCT DESCRIPTION

The AD583 is a monolithic sample and hold circuit consisting of a high performance operational amplifier in series with an ultra-low leakage analog switch and a MOSFET input unity gain amplifier. An external holding capacitor, connected to the switch output, completes the sample-and-hold or track-and-hold function.

With the analog switch closed, the AD583 functions like a standard op amp; any feedback network may be connected around the device to control gain and frequency response. With the switch open the capacitor holds the output at its previous level.

The AD583 may also be used as a versatile operational amplifier with a gated output for applications such as analog switches, peak holding circuits, etc.



Schematic Diagram

PRODUCT HIGHLIGHTS

1. Sample-and-hold operation is obtained with the addition of one external capacitor.
2. Low charge transfer (10pC) and high sample-to-hold current ratio insure accurate tracking.
3. Any gain or frequency response is available using standard op amp feedback networks.
4. High slew rate and low aperature time permit sampling of rapidly changing signals.
5. Output, gated through a low leakage analog switch, also makes the AD583 useful for applications such as analog switches, peak holding circuits, etc.

SPECIFICATIONS (typical @ +25°C and ±15V dc unless otherwise specified)

MODEL	AD583K
OPEN LOOP GAIN R_L = 2kΩ, T_{min} to T_{max}	25k min (50k typ)
OUTPUT VOLTAGE SWING R_L = 2kΩ, T_{min} to T_{max}	±10V min
OUTPUT CURRENT	±10mA min
OUTPUT RESISTANCE	5Ω
OFFSET VOLTAGE T_{min} to T_{max}	6mV max (3mV typ) 8mV max (4mV typ)
BIAS CURRENT T_{min} to T_{max}	200nA max (50nA typ) 400nA max
OFFSET CURRENT T_{min} to T_{max}	50nA max (10nA typ) 100nA max
INPUT RESISTANCE	5MΩ min (10MΩ typ)
COMMON MODE RANGE	±10V min
COMMON MODE REJECTION T_{min} to T_{max}	74dB min (90dB typ)
GAIN BANDWIDTH PRODUCT	2MHz
SLEW RATE Av = +1, R_L = 2kΩ, C_L = 50pF, V_{out} = ±10V p-p	5V/μs
RISE TIME Av = +1, R_L = 2kΩ, C_L = 50pF, V_{out} = 400mV p-p	100ns
OVERSHOOT Av = +1, R_L = 2kΩ, C_L = 50pF, V_{out} = 400mV p-p	20%
DIGITAL INPUT CURRENT V_{in} = 0, T_{min} to T_{max} V_{in} = +5.0V, T_{min} to T_{max}	0.8V max (Logic "Sample") 2.0V min (Logic "Hold")
DIGITAL INPUT VOLTAGE Low T_{min} to T_{max} High T_{min} to T_{max}	0.8V max 2.0V min
ACQUISITION TIME Av = +1, R_L = 2kΩ, C_L = 50pF to 0.1% of final value	4μs
APERTURE TIME	50ns
DRIFT CURRENT T_{min} to T_{max}	50pA max (5pA typ) 1.0nA max (0.05nA typ)
CHARGE TRANSFER	20pC max (10pC typ)
SUPPLY CURRENT	5.0mA max (2.5mA typ)
POWER SUPPLY REJECTION	74dB min (90dB typ)
OPERATING TEMP	0 to +70°C
STORAGE TEMP	-65 to +150°C

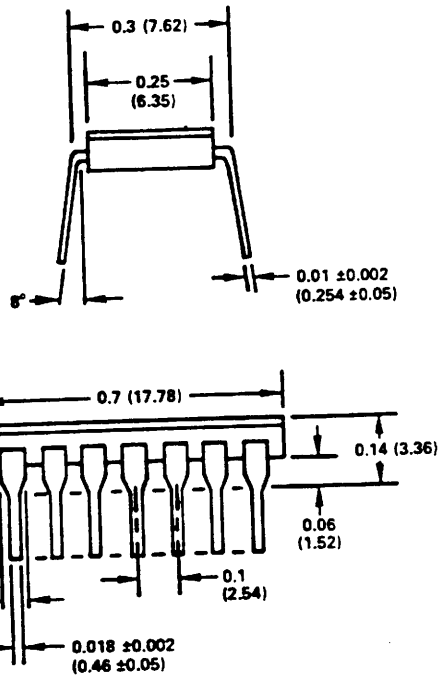
Specifications subject to change without notice.

ABSOLUTE MAXIMUM RATINGS

Voltage between V+ and V- Terminals	40V
Differential Input Voltage	±30V
Digital Voltage (Pin 14)	+8V, -15V
Output Current	Short Circuit Protected
Internal Power Dissipation	30mW (Derate power dissipation by 4.3mW/°C above +150°C ambient temperature)

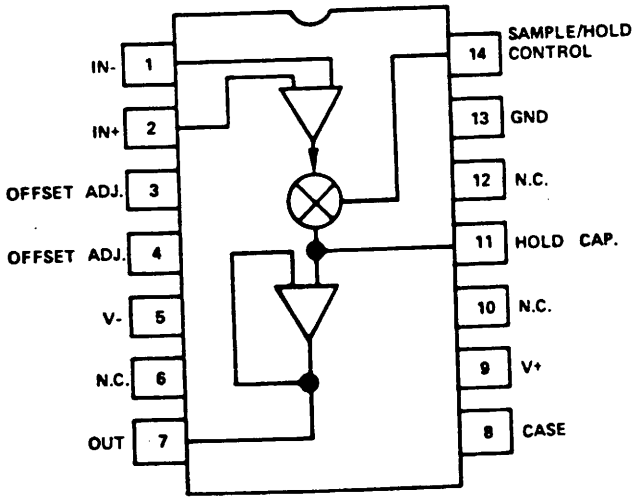
OUTLINE DIMENSIONS

Dimensions shown in inches and (mm)



ALL DIMENSIONS ±0.010 UNLESS OTHERWISE SHOWN

PIN CONFIGURATION



APPLYING THE AD583

Figure 1 shows the AD583 connected in a simple sample and hold configuration with unity gain and offset nulling. Any other standard op amp gain and frequency response configuration may also be used. Note that the holding capacitor, C_H, should have extremely high insulation resistance and low dielectric absorption. Polystyrene (below +85°C), teflon or Mica types are recommended.

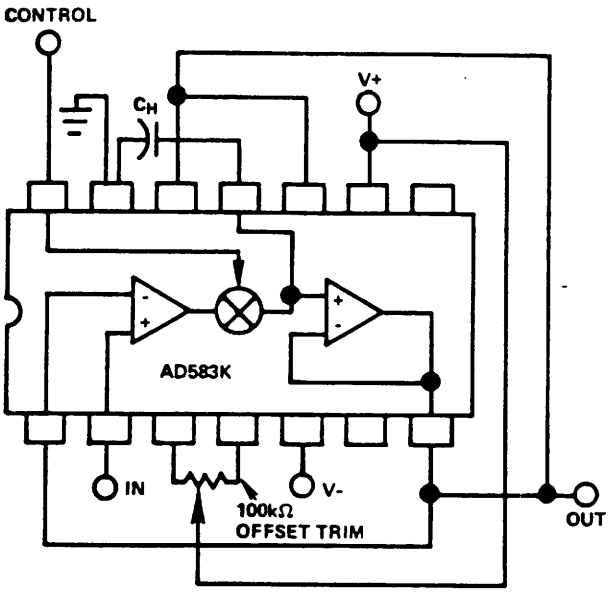


Figure 1. Basic Track-and-Hold/Sample-and-Hold

Figure 2 shows the guard ring used to reduce leakage paths between the pc board and the package. This minimizes drift during the hold command.

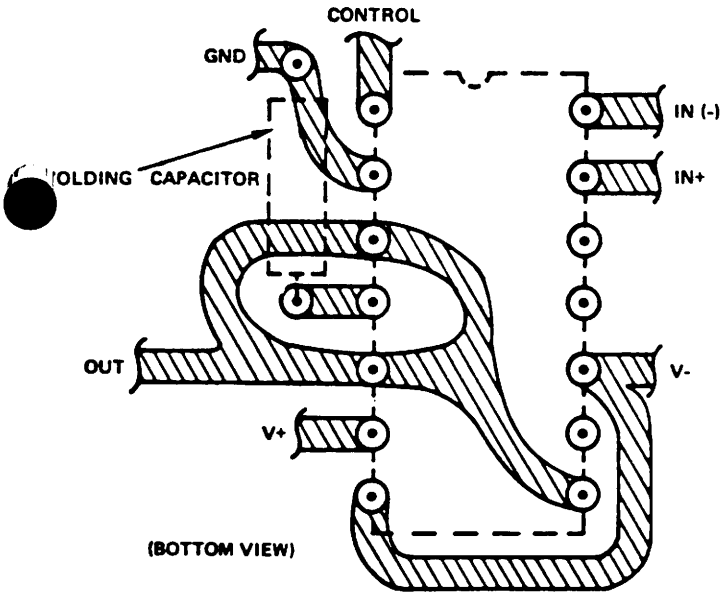


Figure 2. Guard Ring Layout

Also note that the input amplifier of the AD583 may be used as a gated amplifier by utilizing Pin 11 as the output. This amplifier has excellent drive capabilities along with exceptionally low switch leakage.

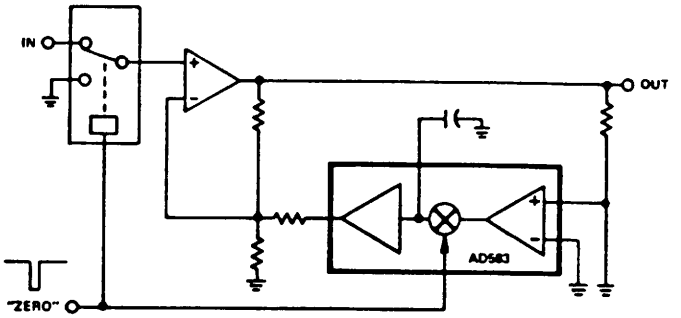


Figure 3. Automatic Offset Zeroing

The circuit of Figure 3 illustrates how the AD583 may be used to automatically zero a high gain amplifier. Basically, the input is periodically grounded and the output offset is then sampled and fed back to cancel the error. This technique is useful in A/D conversion, instrumentation, DVM's to eliminate offset drift errors by periodically rezeroing the system.

Care should be taken to assure that the zeroing loop is dynamically stable. A second sample-and-hold could be added in series with the output to remove the output discontinuity.

DEFINITION OF TERMS

Acquisition Time:
Acquisition Time is the time required by the device to reach its final value within ±0.1% after the sample command has been given. This includes switch delay time, slewing time, and settling time and is the minimum sample time required to obtain a given accuracy.

Charge Transfer:
Charge Transfer is the small charge transferred to the holding capacitor from the interelectrode capacitance of the switch when the unit is switched to the sample mode. Sample-to-hold offset error is directly proportional to this charge, where:

$$\text{Offset Error (V)} = \frac{\text{Charge (pC)}}{C_H\text{(pF)}}$$

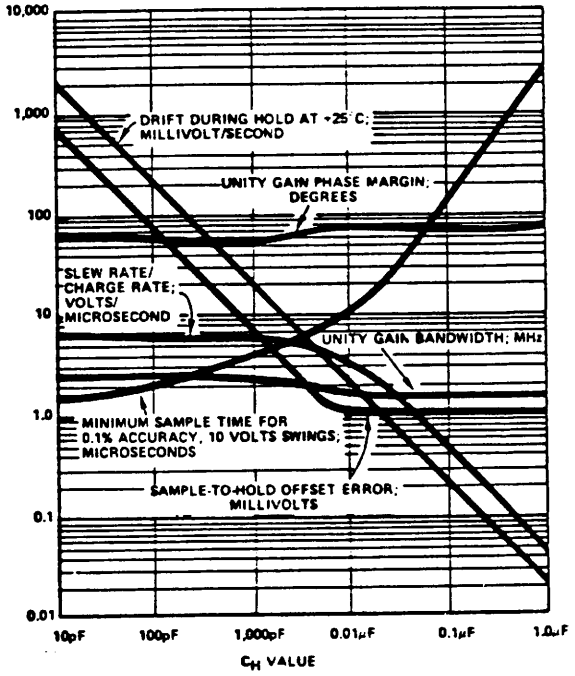
Aperture Time:
The time required after the "hold" command until the switch is fully open. This delays the effective sample timing with rapidly changing input signals.

Drift Current:
Leakage currents from the holding capacitor during the sample mode cause the output voltage to drift. Drift rate (or droop rate) is calculated from drift current values using the formula:

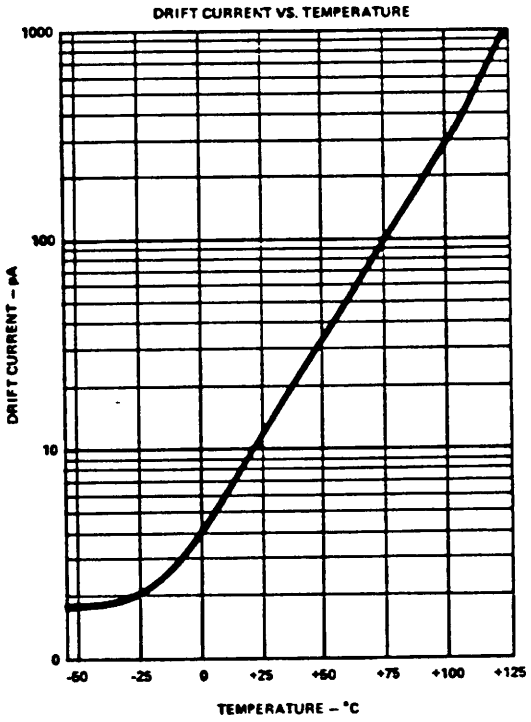
$$\frac{\Delta V}{\Delta T}\ \text{(Volts/sec)} = \frac{I\text{(pA)}}{C_H\text{(pF)}}$$

Performance Curves

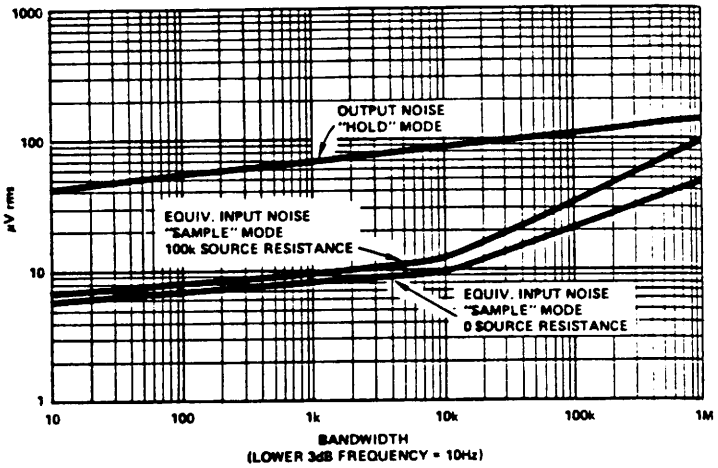
(SUPPLY = ±15V dc, T_A = +25°C, C_H = 1,000pF unless otherwise specified)



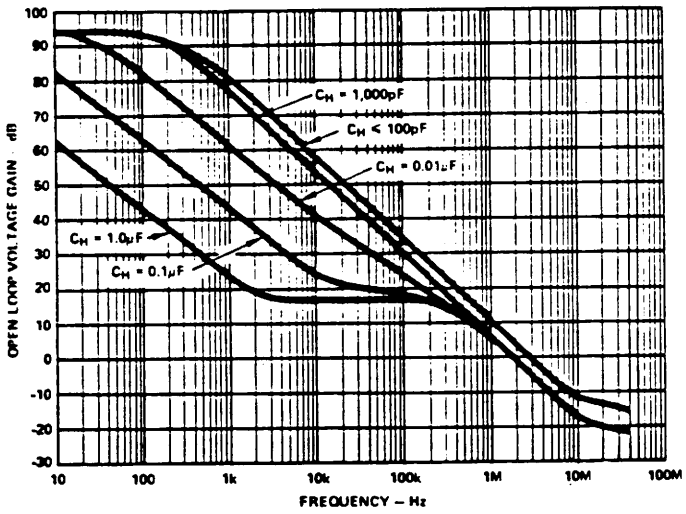
Typical Sample-and-Hold Performance as a Function of Holding Capacitance



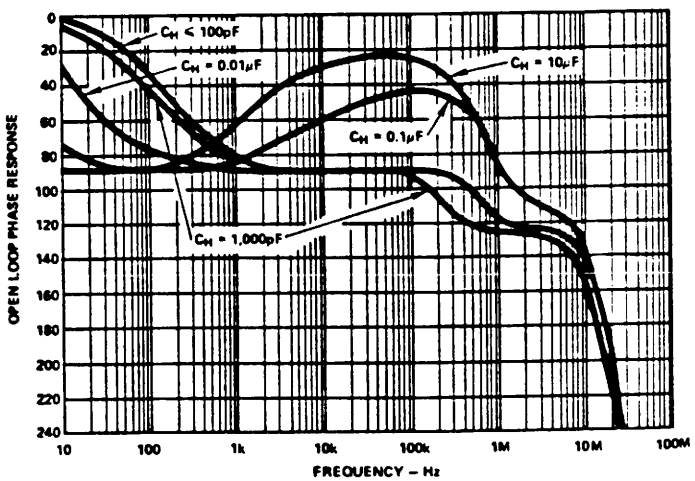
Drift Current vs. Temperature



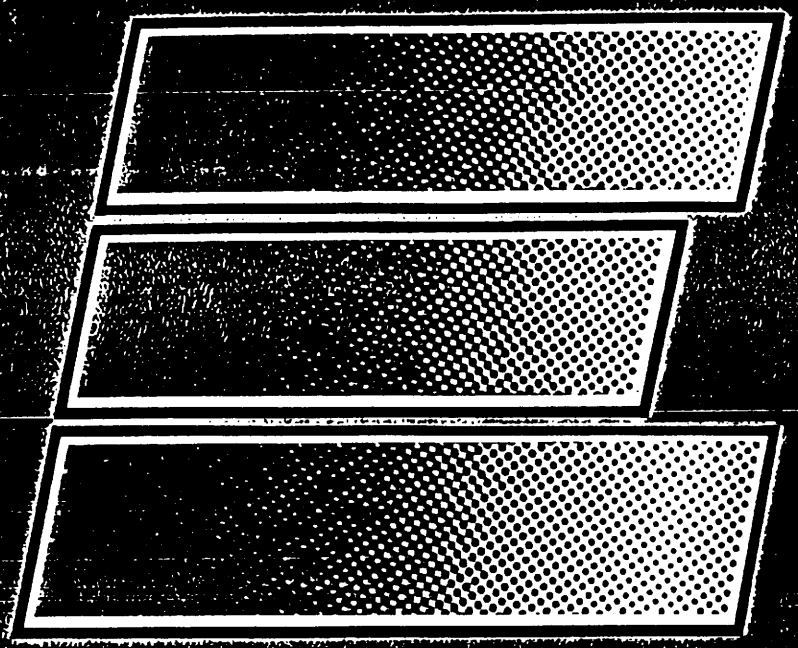
Broadband Noise Characteristics



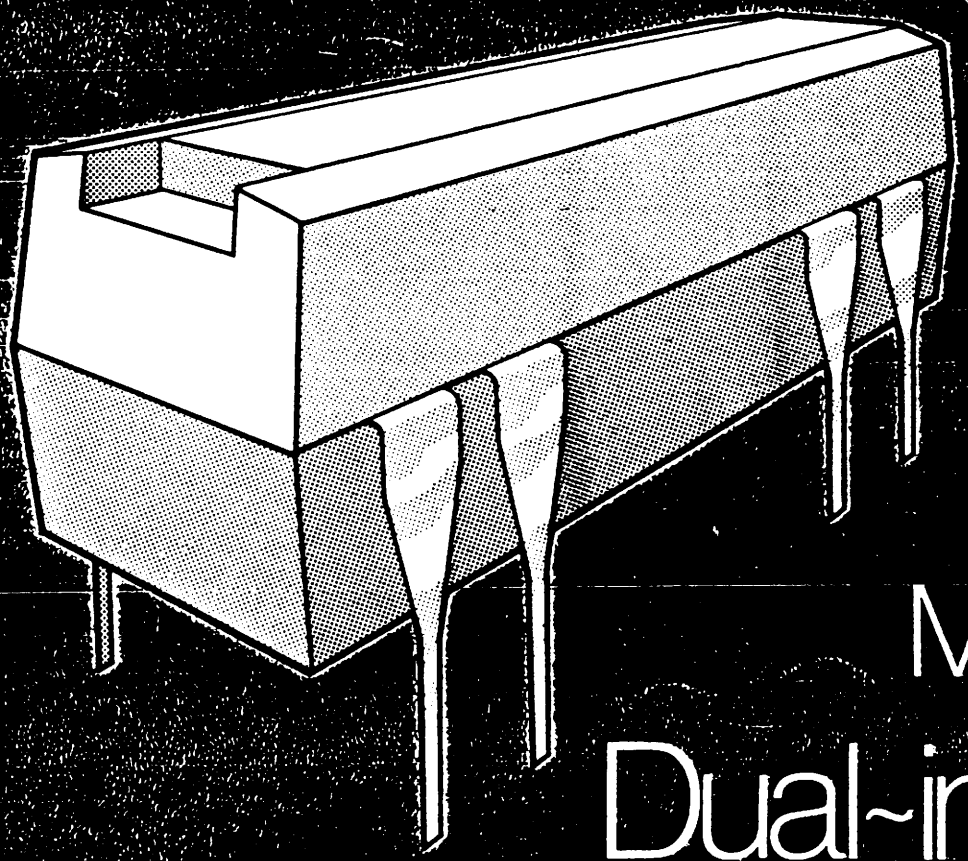
Open Loop Frequency Response



Open Loop Phase Response



Electrothermal
Electronics Division



Mini-Dip Dual-in-Line Reed Relays

Dual-in-Line Reed Relays

A comprehensive range of dual-in-line relays, transfer moulded in high grade epoxy resins for maximum physical strength.

All Electrothermal relays are subjected to a comprehensive test sequence and to vigorous quality control at all stages of manufacture. Our position as a world wide supplier of these relays enables us to offer compatibility with most types offered.

The following standard designs are available:— one pole normally open, two pole normally open and one pole changeover. High isolation types with voltage breakdown of 4KV DC and switching capabilities up to 250 VAC are also available.

To designate the type required state the number of pins, the switch form and coil connections and the nominal coil voltage, e.g. 108 C41 12V, 104 A62 5V or 214 AD25 24V.

General Specification

LIFE	Expected life at 40V DC, 0.25 Amps resistive	5×10^6
INSULATION RESISTANCE	coil to contact across open contacts	$10^9\ \Omega$ @ 200 V. DC. $10^9\ \Omega$ @ max rated voltage
BREAKDOWN VOLTAGE	coil to contact High Isolation types (A62, A64, AD65) coil to screen (if fitted)	500 V. DC. 4000 V. DC. 500 V. DC.
OPERATING TIMES FORM A	make time (inc. bounce) release time release time (with diode)	0.5 msecs. max 0.25 msecs. max 0.5 msecs. max
OPERATING TIMES FORM C	make time (inc. bounce) release time release time (with diode)	1.5 msecs. max 0.5 msecs. max 2.0 msecs. max
OPERATING TEMPERATURE RANGE		−5°C to +70°C (−40°C to +120°C Degraded Specification)
BUMP SEVERITY		1000 bumps @ 245 metres/sec² with 6 msecs pulse duration
VIBRATION SEVERITY (FUNCTIONAL)		Frequency 10 Hz to 1500 Hz Acceleration 98m/sec² Duration 6 hours
MAX OPERATING FREQUENCY		100,000 operations/minute at 50% duty cycle

Technical details subject to change without notice.

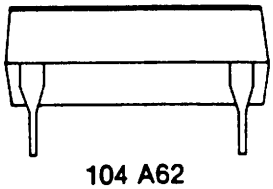
Contact Data

	Single Pole form A	Double Pole form A	Changeover		High Isolation	
			C + CD	CW + CWD	A62	A64/65D
Contact Rating V.A.	10	3	3	4	10	10
Switching Current AC(rms) or DC Amps max.	0.5	0.110	0.25	0.2	0.5	0.5
Switching Voltage DC Volts max.	100	28	28	100	100	200
Breakdown Voltage DC Volts min.	250	200	250	250	250	600
Initial contact resistance mΩ max.	150	200	200	200	150	100

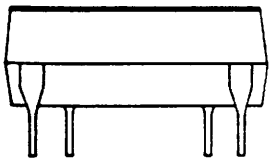
Coil Data

	Nominal Voltage	5	12	24
Single Pole FORM A	Coil Resistance Ω	500	1100	2150
	Nominal Current mA	10	11	11
	Power mW	50	131	267
Two Pole FORM A Single Pole FORM C	Coil Resistance Ω	200	500	2150
	Nominal Current mA	25	24	11
	Power mW	125	288	267

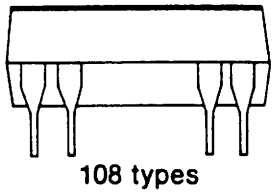
Pin Configurations



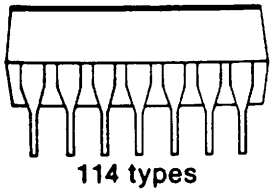
104 A62



104 A64



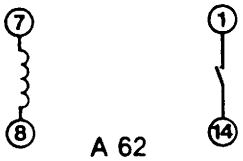
108 types



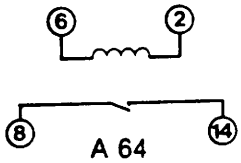
114 types

The High Isolation 104 A62 and 104 A64/AD65 have 4 pins as shown. All other products are available with 8 pins (108) or 14 pins (114).

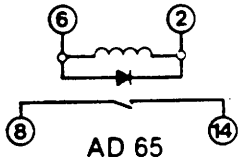
Single Pole
FORM A
High Isolation Types



A 62



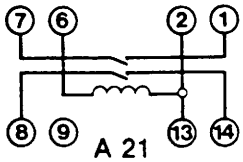
A 64



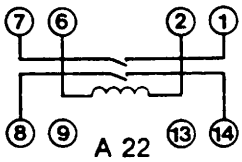
AD 65

FOOTPRINT

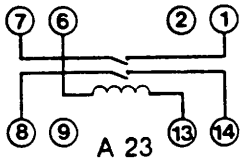
Two Pole
FORM A



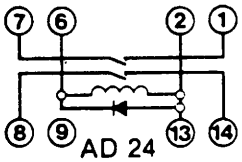
A 21



A 22



A 23



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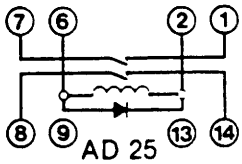
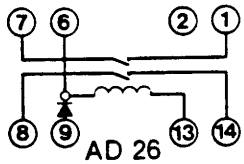


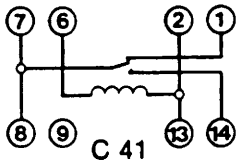
AD 25



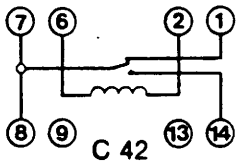
AD 26

FOOTPRINT

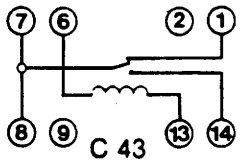
Single Pole
FORM C



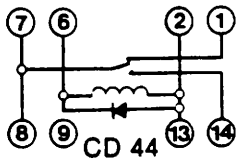
C 41



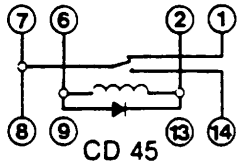
C 42



C 43



CD 44



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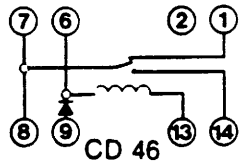

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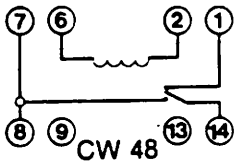
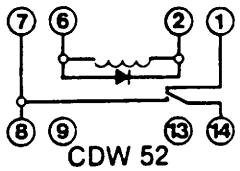


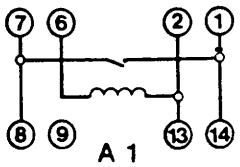
CW 48



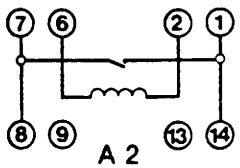
CDW 52

FOOTPRINT

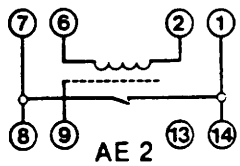
Single Pole
FORM A



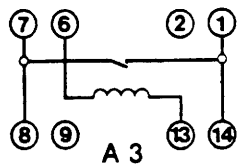
A 1



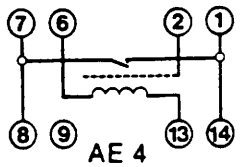
A 2



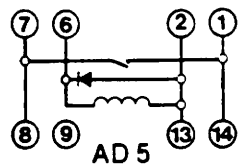
AE 2



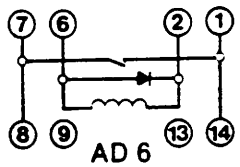
A 3



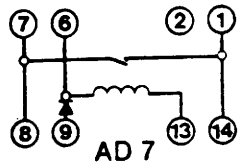
AE 4



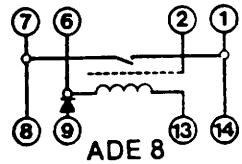
AD 5



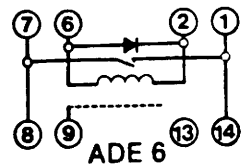
AD 6



AD 7



ADE 8



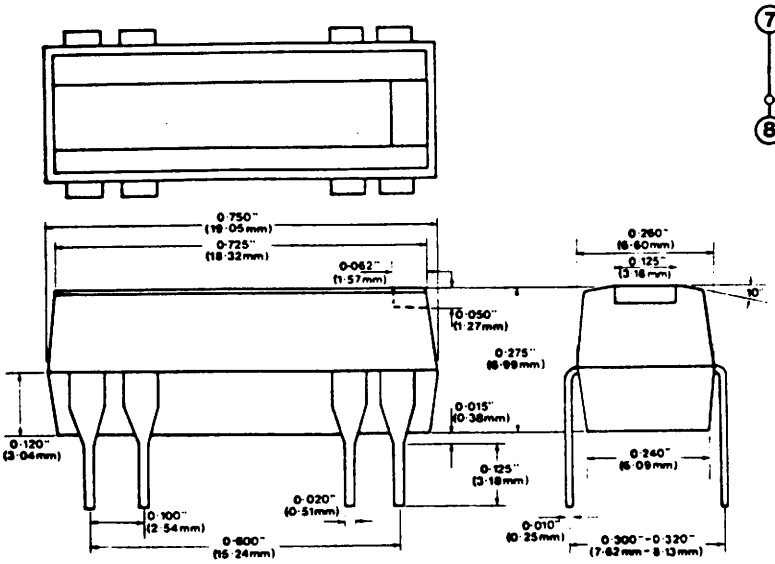
ADE 6

FOOTPRINT

Operating Voltage Levels
(20°C±2°C)

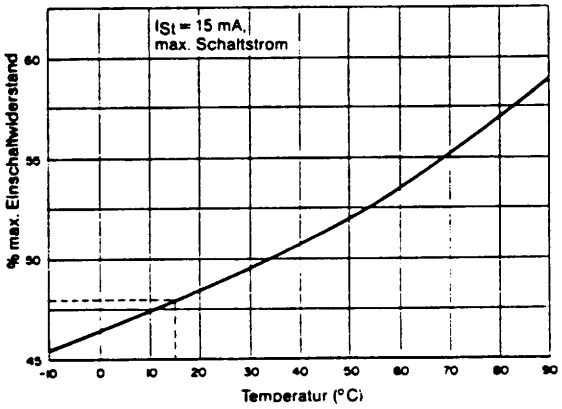
Rated Coil Voltage DC.V.	Pull-in DC.V.	Drop-out DC.V.
5	3.75	0.5
12	8.0	1.0
24	16.0	2.0

Dimensions



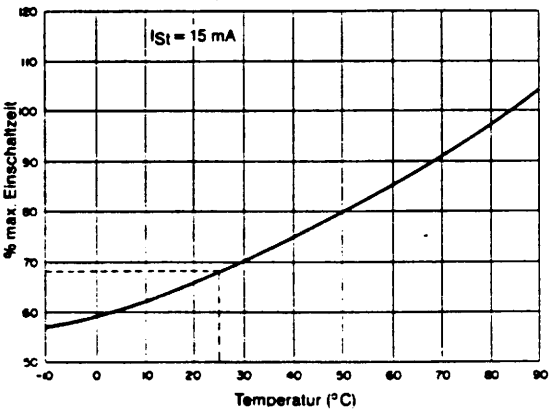
HAMLIN
ELECTRONICS GMBH
Friedberger Straße 124 - Postfach 1306
D-6368 Bad Vilbel bei Frankfurt/Main
Telefon (06193) 70 29 - Telex 04-185023 hamd

Typisches Verhalten
Einschaltwiderstand/Temperatur

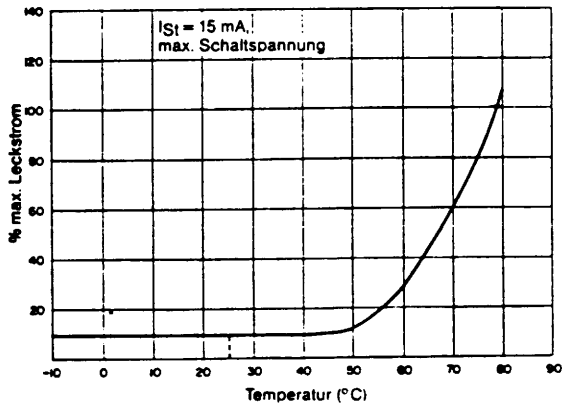


Die Daten beruhen auf Messungen mit einer Impulslänge von 40 ms.

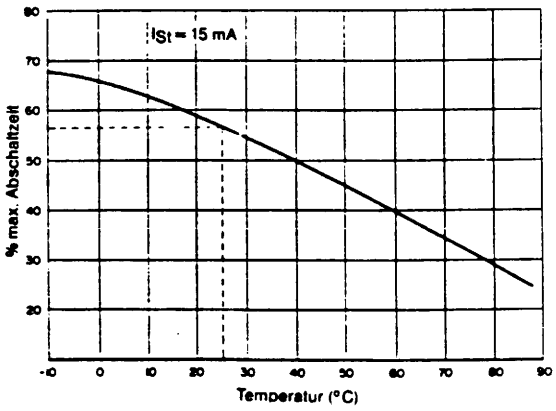
Typisches Verhalten
Einschaltzeit/Temperatur



Typisches Verhalten
Leckstrom/Temperatur



Typisches Verhalten
Abschaltzeit/Temperatur

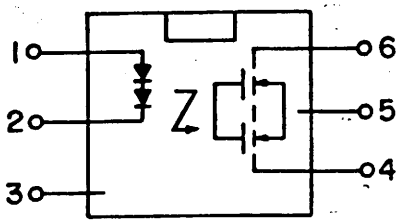


MINI-MOS/03-1282/slo-bo-we/sam 23/Printed in W.-Germany

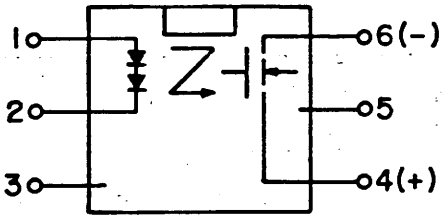
Relaisdaten

(bei 25° C)

SERIE 7900



SERIE 7901



SERIE 7900 –

für Gleich- und Wechselspannungen

Bestell-Nummern		7900-1	7900-2	7900-3	7900-4
Kontaktart		1 Schließer			
Schaltspannung max.	V–	300	200	60	40
Schaltstrom max.[1]	mA–	100	150	200	250
Einschaltwiderstand max.[2]	Ω	70	30	12	2,5
Einschaltzeit typ.[3]	µs	500	500	500	500
Abschaltzeit typ.[4]	µs	300	300	300	300
Steuerstrom[5]	mA–	15	15	15	15

SERIE 7901 –

nur für Gleichspannung

Bestell-Nummern		7901-1	7901-2	7901-3	7901-4
Kontaktart		1 Schließer			
Schaltspannung max.	V–	300	200	60	40
Schaltstrom max.[1]	mA–	150	225	300	375
Einschaltwiderstand max.[2]	Ω	35	15	6	1,25
Einschaltzeit typ.[3]	µs	300	300	300	300
Abschaltzeit typ.[4]	µs	300	300	300	300
Steuerstrom[5]	mA–	15	15	15	15

[1] Stromüberlastung führt zu Fehlschaltungen (offener Schaltkreis).

[2] Gemessen bei max. Schaltstrom und 15 mA Steuerstrom.

[3] Vom Anlegen des Steuersignals (15 mA) bis 90% des max. Laststroms erreicht sind.

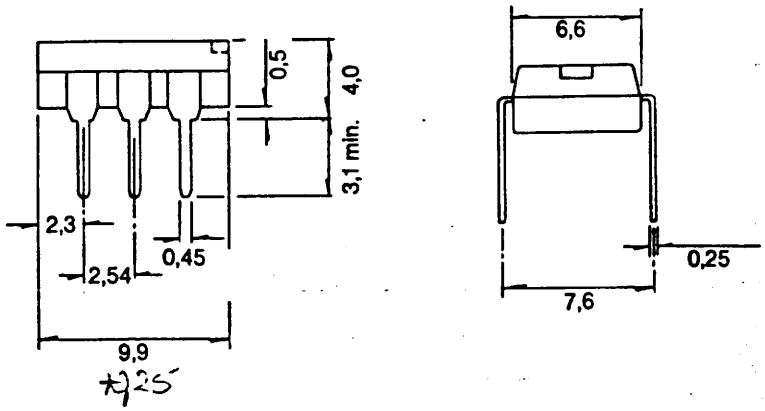
[4] Vom Abschalten des Steuersignals (15 mA) bis die Leckstromrate erreicht ist.

[5] a: Steuerströme bis 50 mA schaden dem Relais nicht.
b: Steuerströme von 5 mA bis 15 mA verändern die Ein- und Ausschaltwerte.
c: Zur Strombegrenzung muß gegebenenfalls ein Vorwiderstand eingesetzt werden.

Relais für andere Schaltströme, -spannungen und Einschaltwiderstände auf Anfrage.

Abmessungen

(sämtliche Maße in mm)



Allgemeine technische Werte

Elektrische Daten

Abschaltspannung	1,6 V– (unveränderlich)
Leckstrom (im Sperrzustand)	1 µA (bei max. Lastspannung)* 0,3 µA (bei 75% der max. Lastspannung)* * gilt nicht für 7900-4 und 7901-4
Steuerstrom max. – kommutiert	20 mA
– 1 ms-Impuls	250 mA
Kapazität (Eingang/Ausgang)	3 pF bei 1 MHz
Isolationsspannung (Eingang/Ausgang)	2500 V~
Isolationswiderstand	10^9 Ω

Mechanische Daten

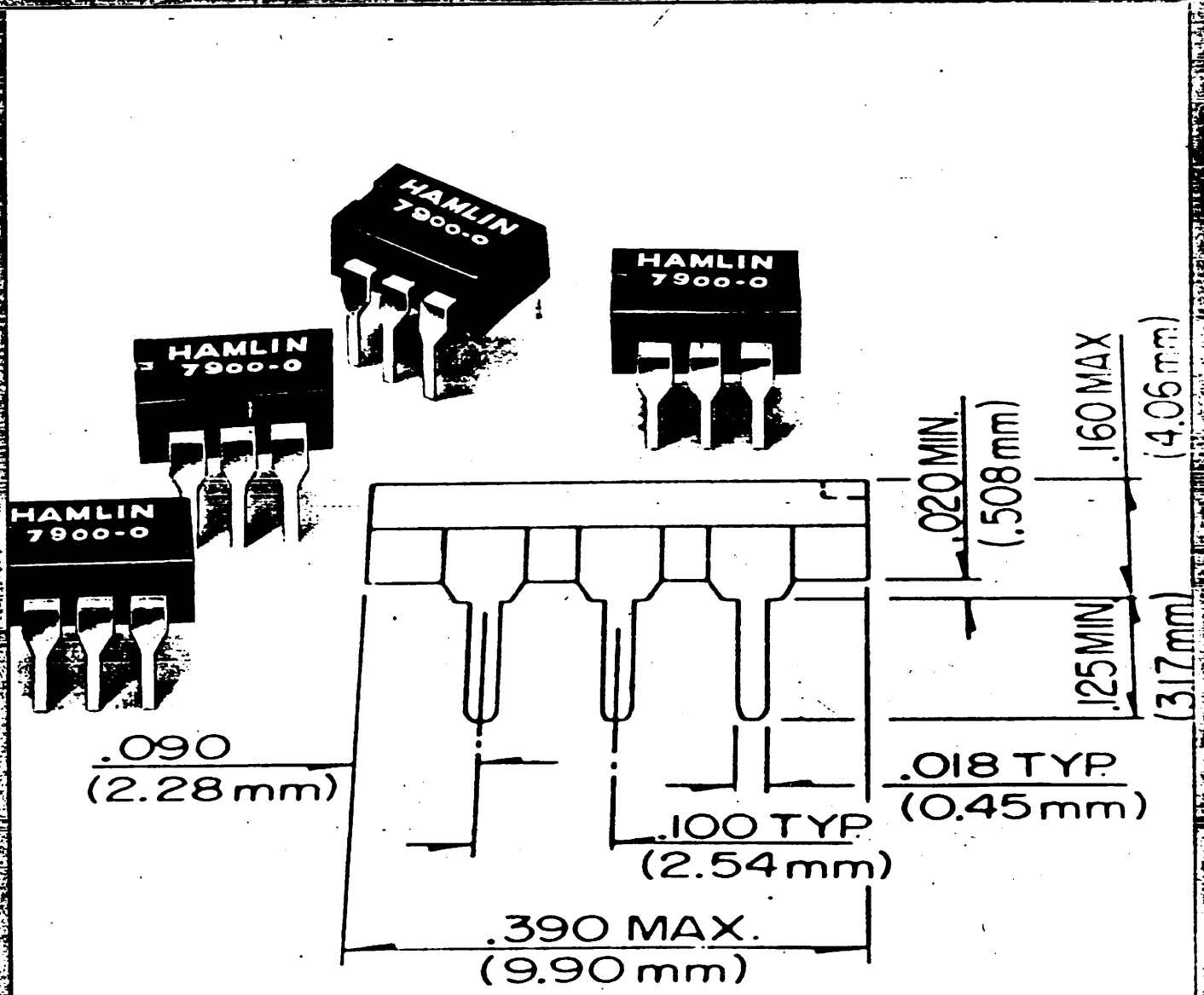
Lagertemperatur	–55° C bis +125° C
Betriebstemperatur	–40° C bis +70° C
Schockfestigkeit	50 g (11 ms) Sinushalbwelle
Schwingfestigkeit	20 g (10–2000 Hz)

HAMLIN

MINI-MOS® Relais

- Keine Beeinflussung durch Radio-Interferenzen
- Keine Spannungsverschiebung
- große Schaltgenauigkeit
- unempfindlich gegenüber Spannungsstößen
- optisch isoliert
- im halben IC-Gehäuse (6 Pins)
- durch Parallelschaltungen können höhere Ströme geschaltet werden
- Wechsel- und Gleichspannung für Ein- und Ausgang möglich

Einsatzbereiche: Telekommunikation, Datenverarbeitung (-Übertragung), Autom. Testeinrichtungen



MANUAL

for

IPC/1 DC/DC Konverterkort 6092

Dansk Data Elektronik A/S

Sept. 1984.

Forfatter Allan Petersen

Sept. 1984

Indholdsfortegnelse:

Introduktion.

IPC/1 6092 Analog forsynings modul.

IPC/1 6092 modulet indeholder en DC/DC converter, der genererer +15 Volt og -15 Volt fra +5 Volt forsyningen i IPC/1 bussen. Disse spændinger føres til de andre IPC/1 moduler via bussystemet.
Kortet anvendes bl.a. i forbindelse med 6016i A/D konverteren.

Maksimal belastning af +/- 15 V : 150 mA.

Kortet indeholder desuden op til 6 spændingsovervågningskredsløb til check af forsyningsspændingerne. Kredsløbet består af to komparatorer, der holder et reed-relæ trukket, sålænge den overvågede spænding ligger inden for et bestemt interval omkring den nominelle spænding. Beliggenheden af intervalmidtpunktet kan justeres med et trimmepotmeter for hver overvågning, mens størrelsen af intervallet er bestemt med faste modstande.

Følgende forsyninger kan overvåges:

+5 Volt	
+12 Volt	(hvis monteret)
+15 Volt	(hvis monteret)
-12 Volt	(hvis monteret)
-15 Volt	(hvis monteret)
Ekstra pos/neg spænding	(hvis monteret)

Relæudgangene (en kontaktslutning for hver overvågning) er isoleret indbyrdes og fra processorstel for 1500 V DC. På kortet findes lysdiodeindikering af relæstillingen.

Tilslutning til periferien foretages via Europakonnektor DIN 41612, byggeform B, 64 polet hanstik.

Funktionel beskrivelse.

Kortet er opbygget som to uafhængige dele:

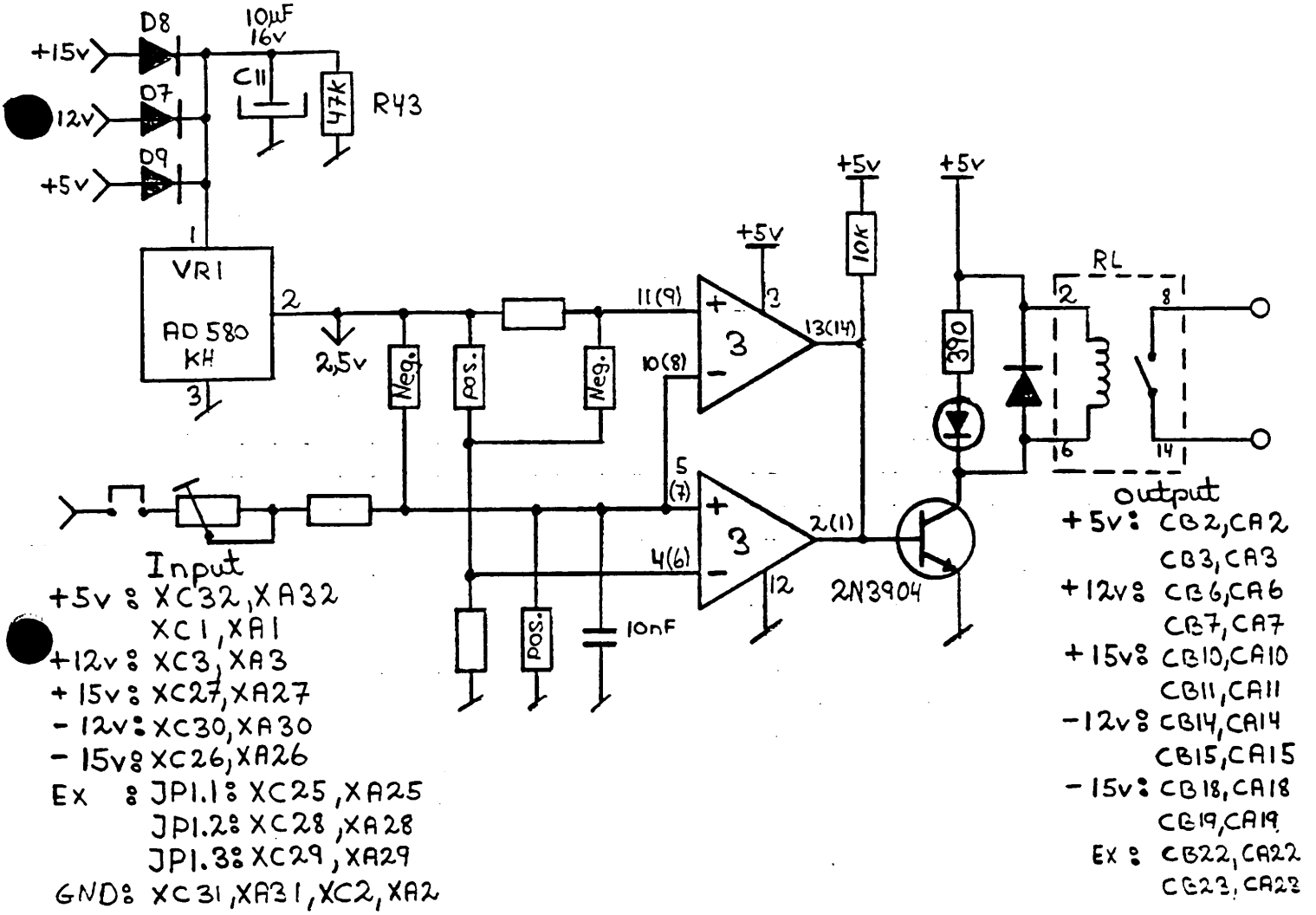
a) En DC/DC konverter, der omsætter den generelle +5 Volt forsyningsspænding fra bussen til en +15 V samt en -15 V spænding, som via hhv. strap JP2 og JP3 kan ledes ud på ledige busledninger og dermed forsyne andre moduler.

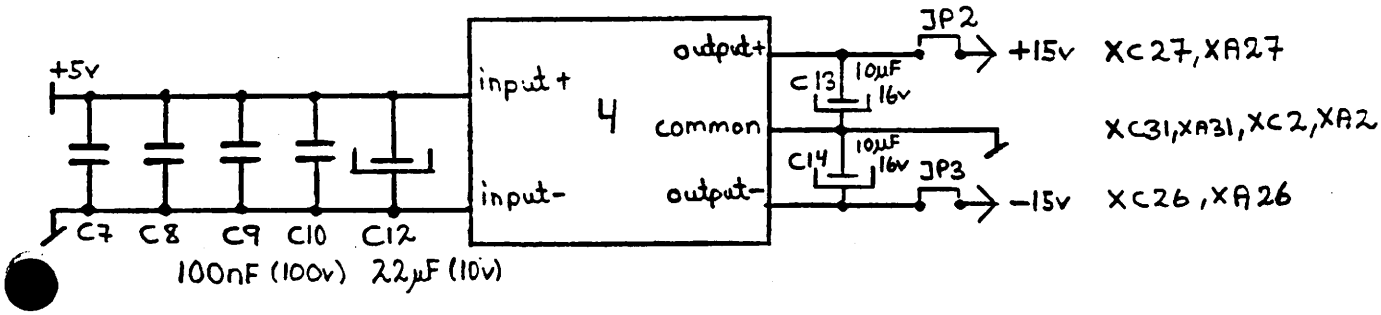
b) Et antal spændingskomparatorer (med fælles reference) til check af forsyningsspændings tolerancer på bussen (plads til ialt 6 stk. komparatorer). På standardudgaven af kortet monteres kun 5 V check.

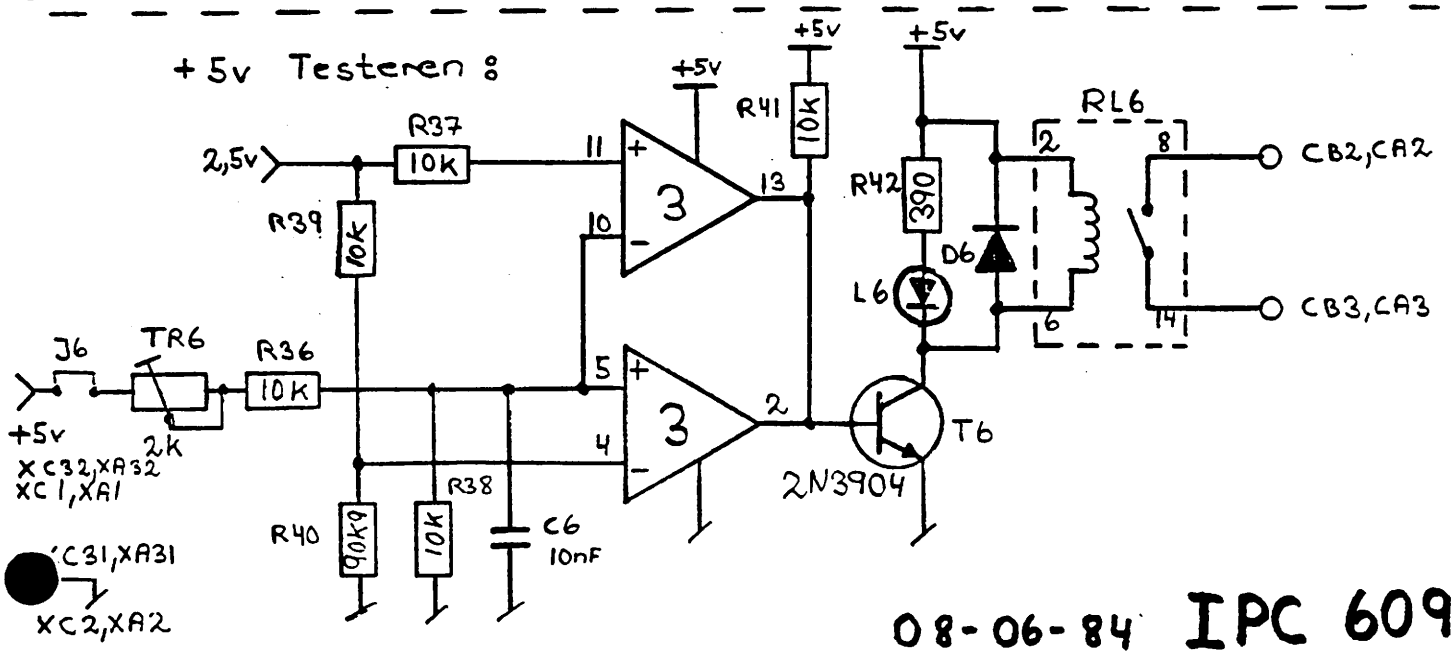
Komparatorerne holder de tilhørende relæer trukket sålænge indgangsspændingen holder indenfor et fastlagt interval.

Sp ndingsreferencen er udført således, at forsyningen til denne tages fra den største af de tilstedeværende spændinger, hvilket medfører at referencen er korrekt indtil alle (positive) spændinger er faldet til under ca. 4 V, d.v.s. indtil alarmkredsløbene har reageret.

TYPE: Ikke benyttet.







08-06-84 IPC 6092

Komponentliste:

KOMPONENTER MÆRKET MED "*" MONTERES IKKE PÅ STANDARDUDGAVE.

	Navn	Komponent	pins	Fabrikat
*	IC1	LM 339 N	14	National
*	IC2	LM 339 N	14	National
	IC3	LM 339 N	14	National
	IC4	3D 5 R15-15	5	Reliability
*	VR1	AD 580 KH	3	Analog Devices
eller	VR2	AD1403	8	Analog Devices

Der monteres kun enten VR1 eller VR2.

*	T1	Transistor 2N3904	Motorola
*	T2	Transistor 2N3904	Motorola
*	T3	Transistor 2N3904	Motorola
*	T4	Transistor 2N3904	Motorola
*	T5	Transistor 2N3904	Motorola
	T6	Transistor 2N3904	Motorola

*	L1	Led (enkelte, men af modulstakbar type)
*	L2	Led (enkelte, men af modulstakbar type)
*	L3	Led (enkelte, men af modulstakbar type)
*	L4	Led (enkelte, men af modulstakbar type)
*	L5	Led (enkelte, men af modulstakbar type)
	L6	Led (enkelte, men af modulstakbar type)

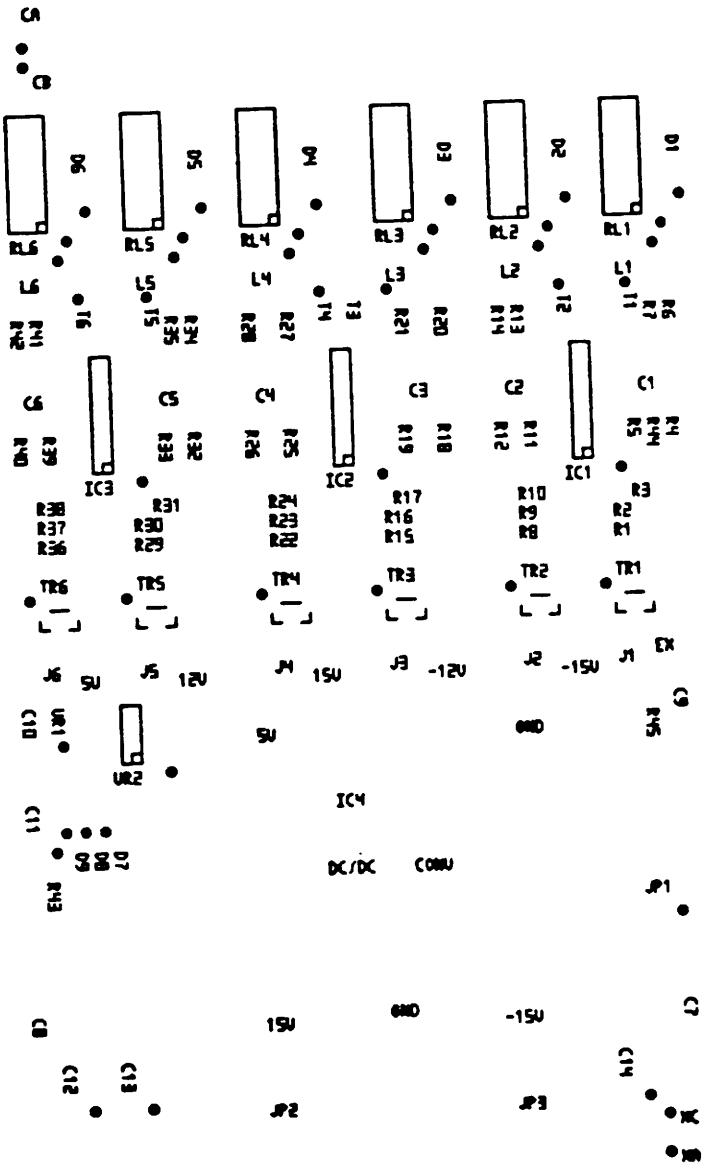
*	D1	Diode 1N4148
*	D2	Diode 1N4148
*	D3	Diode 1N4148
*	D4	Diode 1N4148
*	D5	Diode 1N4148
	D6	Diode 1N4148
	D7	Diode 1N4148
	D8	Diode 1N4148
	D9	Diode 1N4148

* R1	Modstand (Monteres ikke; option)		
* R2	Modstand 12k1	METALFILM	1%
* R3	Modstand 7k50	METALFILM	1%
* R4	Modstand 8k25	METALFILM	1%
* R5	Modstand 1k00	METALFILM	1%
* R6	Modstand 390 ohm		
* R7	Modstand 10 k		
* R8	Modstand 75k0	METALFILM	1%
* R9	Modstand 12k1	METALFILM	1%
* R10	Modstand 7k50	METALFILM	1%
* R11	Modstand 1k00	METALFILM	1%
* R12	Modstand 8k25	METALFILM	1%
* R13	Modstand 10k		
* R14	Modstand 390 ohm		
* R15	Modstand 61k9	METALFILM	1%
* R16	Modstand 12k1	METALFILM	1%
* R17	Modstand 7k50	METALFILM	1%
* R18	Modstand 8k25	METALFILM	1%
* R19	Modstand 1k00	METALFILM	1%
* R20	Modstand 390 ohm		
* R21	Modstand 10k		
* R22	Modstand 47k5	METALFILM	1%
* R23	Modstand 13k0	METALFILM	1%
* R24	Modstand 10k0	METALFILM	1%
* R25	Modstand 13k0	METALFILM	1%
* R26	Modstand 182k	METALFILM	1%
* R27	Modstand 10k		
* R28	Modstand 390 ohm		
* R29	Modstand 35k7	METALFILM	1%
R30	Modstand 13k0	METALFILM	1%
R31	Modstand 10k0	METALFILM	1%
R32	Modstand 150k	METALFILM	1%
R33	Modstand 13k0	METALFILM	1%
* R34	Modstand 390 ohm		
* R35	Modstand 10k		
R36	Modstand 10k0	METALFILM	1%
R37	Modstand 10k0	METALFILM	1%

	R38	Modstand 10k0	METALFILM 1%
	R39	Modstand 10k0	METALFILM 1%
	R40	Modstand 90k9	METALFILM 1%
	R41	Modstand 10k	
	R42	Modstand 390 ohm	
	R43	Modstand 47k	
*	R44	Modstand (Monteres ikke; option)	
*	R45	Modstand (Monteres ikke; option)	
*	TR1	Trimmepot 10k	(f.eks Bourns 3386P-1-103)
*	TR2	Trimmepot 10k	(f.eks Bourns 3386P-1-103)
*	TR3	Trimmepot 10k	(.eks Bourns 3386P-1-103)
*	TR4	Trimmepot 10k	(f.eks Bourns 3386P-1-103)
*	TR5	Trimmepot 5k	(f.eks Bourns 3386P-1-502)
	TR6	Trimmepot 2k	(f.eks Bourns 3386P-1-202)
*	C1	Afkobling 10 nF Ker.	
*	C2	Afkobling 10 nF Ker.	
*	C3	Afkobling 10 nF Ker.	
*	C4	Afkobling 10 nF Ker.	
*	C5	Afkobling 10 nF Ker.	
	C6	Afkobling 10 nF Ker.	
	C7	Afkobling 100 nF	Siemens
	C8	Afkobling 100 nF	Siemens
	C9	Afkobling 100 nF	Siemens
	C10	Afkobling 100 nF	Siemens
	C11	10 uF, 16 V Sol.Al.	Philips
		(Philips kodenr. 2222 122 55109)	
	C12	22 uF, 10 V Sol.Al.	Philips
		(Philips kodenr. 2222 122 54229)	
	C13	10 uF, 16 V Sol.Al.	Philips
	C14	10 uF, 16 V Sol.Al.	Philips
*	RL1	104 A 64 5 V. Reedrelæ	Electrothermal
*	RL2	104 A 64 5 V. Reedrelæ	Electrothermal
*	RL3	104 A 64 5 V. Reedrelæ	Electrothermal
*	RL4	104 A 64 5 V. Reedrelæ	Electrothermal

* RL5	104 A 64 5 V. Reedrelæ	Electrothermal
RL6	104 A 64 5 V. Reedrelæ	Electrothermal
J1 til J6	Jumper, se tekst.	
JP1 til JP3	Jumper, se tekst.	
XA/XC	Euro-connector 64 pins (a og c)	
CA/CB	Euro-connector 64 pins (a og b)	

Komponentplacering 6092:



Strapsettings for IPC/1 DC/DC konverterkort 6092:

J1: Åbnes ved justering af Ekstra sp. detect.

J2: Åbnes ved justering af - 15 Volt detect.

J3: Åbnes ved justering af - 12 Volt detect.

J4: Åbnes ved justering af + 15 Volt detect.

J5: Åbnes ved justering af + 12 Volt detect.

J6: Åbnes ved justering af + 5 Volt detect.

JP1: Ekstra sp. detect fra: 1) XA25,XC25
2) XA28,XC28
3) XA29,XC29

JP2: +15 V fra konverter til bus XA27,XC27

JP3: -15 V fra konverter til bus XA26,XC26

Forbindelser til stik:

Pin:	a	b
1	NC.	NC.
2	+5 V detect relækontakt side A	
3	+5 V detect relækontakt side B	
4	NC.	NC.
5	NC.	NC.
6	+12 V detect relækontakt side A	
7	+12 V detect relækontakt side B	
8	NC.	NC.
9	NC.	NC.
10	+15 V detect relækontakt side A	
11	+15 V detect relækontakt side B	
12	NC.	NC.
13	NC.	NC.
14	-12 V detect relækontakt side A	
15	-12 V detect relækontakt side B	
16	NC.	NC.
17	NC.	NC.
18	-15 V detect relækontakt side A	
19	-15 V detect relækontakt side B	
20	NC.	NC.
21	NC.	NC.
22	Eks V detect relækontakt side A	
23	Eks V detect relækontakt side B	
24	NC.	NC.
25	NC.	NC.
26	NC.	NC.
27	NC.	NC.
28	NC.	NC.
29	NC.	NC.
30	NC.	NC.
31	NC.	NC.
32	NC.	NC.

Forbindelser til bus:

Pin:	a	c
1	+ 5 V	+ 5 V
2	GND	GND
3	+ 12 V	+ 12 V
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25	JP1pin1	JP1pin1
26	(- 15 V)	(- 15 V)
27	(+ 15 V)	(+ 15 V)
28	JP1pin2	JP1pin2
29	JP1pin3	JP1pin3
30	- 12 V	- 12 V
31	GND	GND
32	+ 5 V	+ 5 V

Justeringsvejledning:

+ 5 Volt detect: Inden ilodning af strap J6 tilsluttes en spændingsforsyning på 4,70 Volt til den side af J6, der har forbindelse til trimmepotm. TR6, hvorefter et ohmmeter forbindes til konnektor C pin 2 og 3. Trimmepotm. TR6 justeres da til netop det punkt, hvor ohmmeteret skifter mellem on og off.

De øvrige detektorer justeres efter samme procedure, og områdegrænserne er:

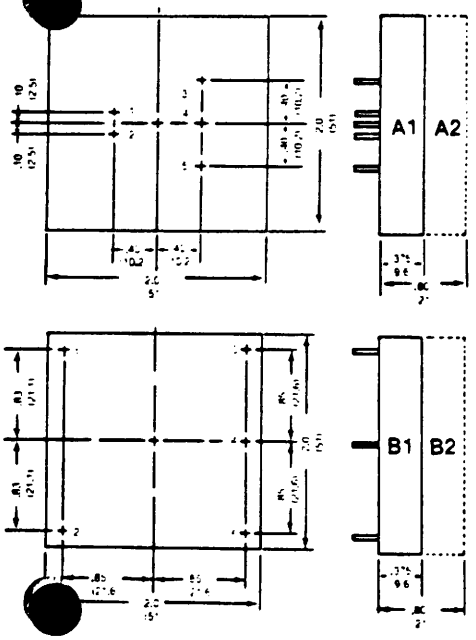
For + 5 V:	Fra	4,70 V	til	5,20 V
For + 12 V:	Fra	11,50 V	til	12,50 V
For + 15 V:	Fra	14,50 V	til	15,50 V
For - 12 V:	Fra	-11,50 V	til	-12,50 V
For - 15 V:	Fra	-14,50 V	til	-15,50 V

SERIES 3A, 3D, 5A, 5D

These high performance power sources are ideally suited for applications requiring very low ripple and noise such as precision data acquisition modules and high performance operational amplifiers. Direct operation from batteries is facilitated by the wide input voltage range and in-put reflected ripple is held to a minimum by the use of a highly efficient π input filter. All devices are designed for printed circuit board mounting and the low profile of series 3A and 3D allow them to be used on .5 inch centers.

All units are encapsulated in a black finished metal case and feature short circuit and thermal overload protection. To insure the most reliable power sources possible, only hermetically sealed tantalum capacitors are used and all devices are 100 percent burned-in and triple tested prior to shipment.

PIN CONNECTIONS & PACKAGE DIMENSIONS



1	+ Input
2	– Input
3	+ Output
4	– Output
5	– Output

1	+ Input
2	– Input
3	+ Output
4	Common
5	– Output

NOTE 1: All dimensions in inches (mm).
NOTE 2: Pins are .040 (1.0) diameter.

SELECTION GUIDE

3A 5 R5	4.5 - 5.5			A1
3D 5 R5				B1
3A 12 R5	10.8 - 13.2	5	600	A1
3D 12 R5				B1
3A 24 R5	21.6 - 26.4			A1
3D 24 R5				B1
3A 5 R12-12	4.5 - 5.5			A1
3D 5 R12-12				B1
3A 12 R12-12	10.8 - 13.2	± 12	± 150	A1
3D 12 R12-12				B1
3A 24 R12-12	21.6 - 26.4			A1
3D 24 R12-12				B1
3A 5 R15-15	4.5 - 5.5			A1
3D 5 R15-15				B1
3A 12 R15-15	10.8 - 13.2	± 15	± 150	A1
3D 12 R15-15				B1
3A 24 R15-15	21.6 - 26.4			A1
3D 24 R15-15				B1
5A 5 R5	4.5 - 5.5			A2
5D 5 R5				B2
5A 12 R5	10.8 - 13.2	5	1000	A2
5D 12 R5				B2
5A 24 R5	21.6 - 26.4			A2
5D 24 R5				B2
5A 5 R12-12	4.5 - 5.5			A2
5D 5 R12-12				B2
5A 12 R12-12	10.8 - 13.2	± 12	± 250	A2
5D 12 R12-12				B2
5A 24 R12-12	21.6 - 26.4			A2
5D 24 R12-12				B2
5A 5 R15-15	4.5 - 5.5			A2
5D 5 R15-15				B2
5A 12 R15-15	10.8 - 13.2	± 15	± 250	A2
5D 12 R15-15				B2
5A 24 R15-15	21.6 - 26.4			A2
5D 24 R15-15				B2

SPECIFICATIONS At nominal Vin and 25°C unless specified.

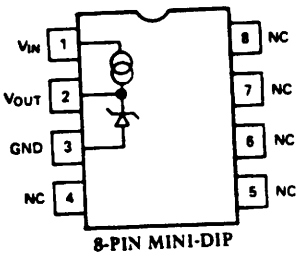
Output Voltage Tolerance	± 1%	Factory set
Line Regulation	0.02%	Max. LL to HL
Load Regulation	0.02%	Max. NL to FL ± 12 v and ± 15 V output models
	0.1%	5v output models
Output Ripple and Noise	1mv RMS	Max., 20 Hz to 20 MHz Bandwidth
Input Reflected Ripple	1%	Of maxiumum Vin
Input-Output Isolation	500 v DC	Minimum
Temperature Coefficient	0.01%/°C	Typical
Operating Temperature	–25°C to 70°C	Still air
Storage Temperature	–35°C to 125°C	Still air
Efficiency	55-65%	At nominal Vin and FL
Short Circuit Protection	All units	
Thermal Overload Protection	All units	
Input Voltage Range	See selection guide	

Low Cost, Precision 2.5 Volt IC Reference

AD1403/AD1403A*

FEATURES
Improved, Lower Cost, Replacements for Standard 1403, 1403A
3-Terminal Device: Voltage In/Voltage Out
Laser Trimmed to High Accuracy: 2.500V ±10mV (AD1403A)
Excellent Temperature Stability: 25ppm/°C (AD1403A)
Low Quiescent Current: 1.5mA max
Low Cost
Convenient MINI-DIP PACKAGE

AD1403/AD1403A
FUNCTIONAL BLOCK DIAGRAM



8-PIN MINI-DIP

8

PRODUCT DESCRIPTION

The AD1403 and AD1403A are improved three-terminal, low cost, temperature compensated, bandgap voltage references that provide a fixed 2.5V output voltage for inputs between 4.5V and 40V. A unique combination of advanced circuit design and laser-wafer-trimmed thin-film resistors provides the AD1403/AD1403A with an initial tolerance of ±10mV and a temperature stability of better than 25ppm/°C. In addition, the low quiescent current drain of 1.5mA (max) offers a clear advantage over classical zener techniques.

The AD1403 or AD1403A is recommended as a stable reference for all 8-, 10- and 12-bit D-to-A converters that require an external reference. In addition, the wide input range of the AD1403/AD1403A allows operation with 5 volt logic supplies, making these devices ideal for digital panel meter applications and when only a single logic supply is available.

The AD1403 and AD1403A are specified for operation over the 0 to +70°C temperature range. The AD580 series of 2.5 volt precision IC references is recommended for applications where operation over the −55°C to +125°C range is required.

*Covered by Patent Numbers: 3,887,863; RE30,586.

PRODUCT HIGHLIGHTS

1. The AD1403A offers improved initial tolerance over the industry-standard 1403A: ±10mV versus ±25mV at a lower cost.
2. The three-terminal voltage in/voltage out operation of the AD1403/AD1403A provides a regulated output voltage without any external components.
3. The AD1403/AD1403A provides a stable 2.5V output voltage for input voltages between 4.5V and 40V making these devices ideal for systems that contain a single logic supply.
4. Thin film resistor technology and tightly controlled bipolar processing provide the AD1403A with temperature stabilities of 25ppm/°C.
5. The low 1.5mA maximum quiescent current drain of the AD1403 and AD1403A makes them ideal for CMOS and other low power applications.

SPECIFICATIONS (V_{IN} = 15V, T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (I_O = 0mA)	V_O				
AD1403		2.475	2.500	2.525	V
AD1403A		2.490	2.500	2.510	
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$				ppm/°C
AD1403		–	10	40	
AD1403A		–	10	25	
Output Voltage Change, 0 to +70°C	ΔV_O				mV
AD1403		–	–	7.0	
AD1403A		–	–	4.4	
Line Regulation	Reg_{in}				mV
(15V≤V_{IN}≤40V)		–	1.2	4.5	
(4.5≤V_{IN}≤15V)		–	0.6	3.0	
Load Regulation (0mA<I_O<10mA)	Reg_{load}	–	–	10	mV
Quiescent Current (I_O = 0mA)	I_I	–	1.2	1.5	mA

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Input Voltage	V_{IN}	40	V
Storage Temperature	T_{STG}	-25 to 100	°C
Junction Temperature	T_J	+175	°C
Operating Ambient Temperature Range	T_A	0 to +70	°C

Specifications subject to change without notice.

ORDERING INFORMATION

Device	Initial Tolerance	Package Style[1]
AD1403N	±25mV	N8A
AD1403AN	±10mV	N8A

[1] See Section 20 for package outline information.

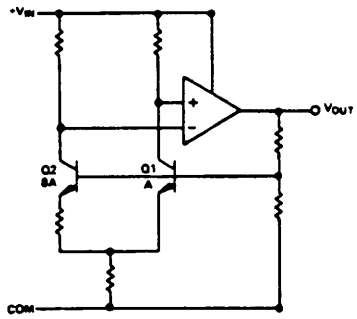


Figure 1. AD1043/AD1403A Functional Diagram

Typical Performance Curves

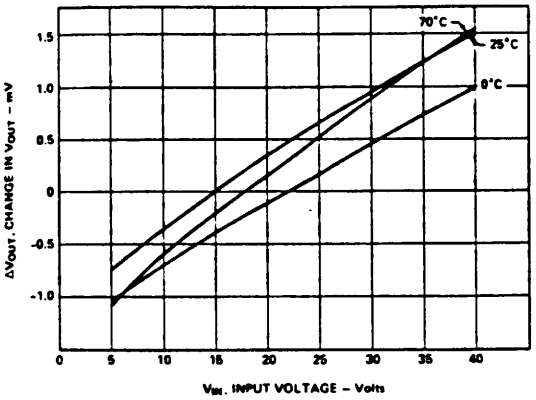


Figure 2. Typical Change in V_{OUT} vs. V_{IN} (Normalized to V_{OUT} @ V_{IN} = 15V @ T_C = 25°C)

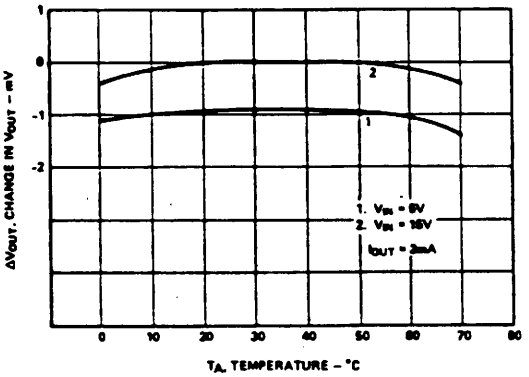


Figure 5. Change in V_{OUT} vs. Temperature (Normalized to V_{OUT} @ V_{IN} = 15V)

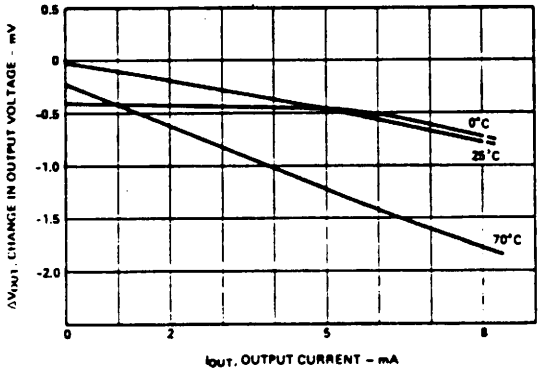


Figure 3. Change in Output Voltage vs. Load Current (Normalized to V_{OUT} @ V_{IN} = 15V, I_{OUT} = 0mA)

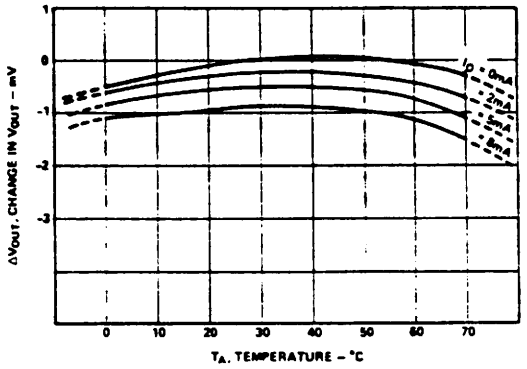


Figure 6. Change in V_{OUT} vs. Temperature (Normalized to V_{OUT} @ V_{IN} = 15V, I_{OUT} = 0mA)

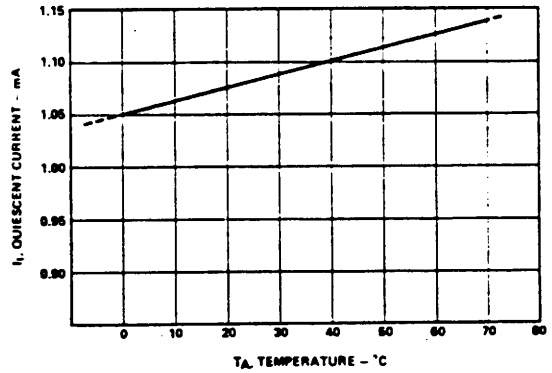


Figure 4. Quiescent Current vs. Temperature (V_{IN} = 15V, I_{OUT} = 0mA)

Applying the AD1403/AD1403A

VOLTAGE VARIATION VS. TEMPERATURE AND LINE

Some confusion exists in the area of defining and specifying reference voltage error over temperature. Historically, references are characterized using a maximum deviation per degree Centigrade; i.e., 10ppm/°C. However, because of the inconsistent nonlinearities in zener references (butterfly or "S" type characteristics), most manufacturers use a maximum limit error band approach to characterize their references. This technique measures the output voltage at 3 to 5 different temperatures and guarantees that the output voltage deviation will fall within the guaranteed error band at these discrete temperatures. This approach, of course, makes no mention or guarantee of performance at any other temperature within the operating temperature range of the device.

The consistent Voltage vs. Temperature performance of a typical AD1403 is shown in Figure 5. Note that the characteristic is quasi-parabolic, not the possible "S" type characteristics of classical zener references. This parabolic characteristic permits a maximum output deviation specification over the device's full operating temperature range, rather than just at 3 to 5 discrete temperatures.

The AD1403 exhibits a worst-case shift of 7.5mV over the entire range of operating input voltage, 4.5 volts to 40 volts. Typically, the shift is less than 1mV as shown in Figure 2.

THE AD1403A AS A LOW POWER, LOW VOLTAGE PRECISION REFERENCE FOR DATA CONVERTERS

The AD1403A has a number of features that make it ideally suited for use with A/D and D/A data converters used in complex microprocessor-based systems. The calibrated 2.500 volt output minimizes user trim requirements and allows operation from a single low voltage supply. Low power consumption (1.5mA quiescent current) is commensurate with that of CMOS-type devices, while the low cost and small package complements the decreasing cost and size of the latest converters.

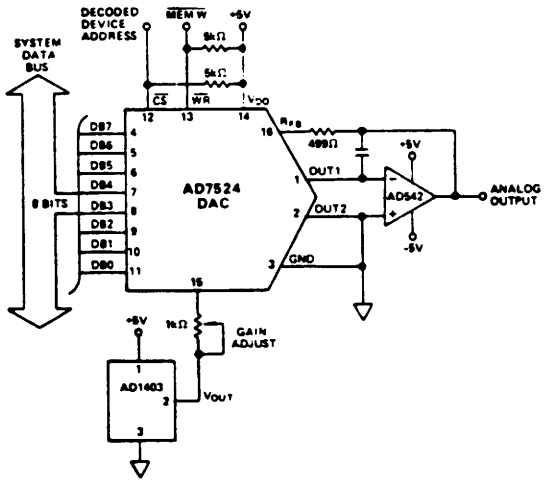


Figure 7. Low Power, Low Voltage Reference for the AD7524 Microprocessor-Compatible 8-Bit DAC

Figure 7 shows the AD1403A used as a reference for the AD7524 low-cost 8-bit CMOS DAC with complete microprocessor interface. The AD1403A and the AD7524 are specified to operate from a single 5 volt supply; this eliminates the need to provide a +15 volt power supply for the sole purpose of operating a reference. The AD7524 includes an 8-bit data register, and address decoding logic; it may thus be interfaced directly to an 8- or 16-bit data bus. Only 300μA of quiescent current from the single +5 volt supply is required to operate the AD7524 which is packaged in a small 16 pin DIP. The AD542 output amplifier is also low power, requiring only 1.5mA quiescent current. Its laser-trimmed offset voltage preserves the ±1/2LSB linearity of the AD7524KN without user trims and it typically settles to ±1/2LSB in less than 5 microseconds. It will provide the 0 volt to -2.5 volt output swing from ±5 volt supplies.

THE AD1403 AS A PRECISION PROGRAMMABLE CURRENT SOURCE

The AD1403 is an excellent building block for precision current sources. Its wide range of operating voltages, 4.5V to 40V, along with excellent line regulation over that range (7.5mV) result in high insensitivity to varying load impedances. The low quiescent current (I_1) of 1.5mA (max) and the maximum specified maximum load current of 10mA allows the user to program current to any value between 1.5mA and 10mA.

Figure 8a shows the AD1403 connected as a current source. Total current is equal to the quiescent current plus the load current. Most of the temperature coefficient comes from the quiescent current term I_1, which has a typical TC of 0.13%/°C (1300ppm/°C). The load voltage (and hence current) TC is much lower at ±40ppm/°C max (AD1403). Therefore, the overall temperature coefficient decreases rapidly as the load current is increased. Figure 8a shows the typical temperature coefficient for currents between 1.5mA and 10mA. Use of an AD1403A will not improve the TC appreciably.

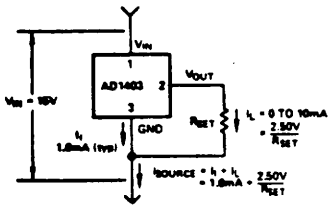


Figure 8a. The AD1403 as a Precision Programmable Current Source

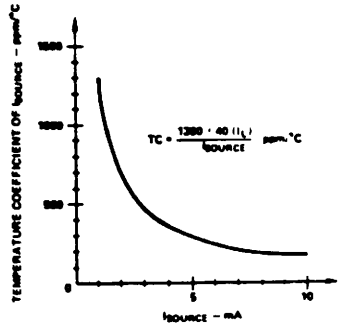


Figure 8b. Typical Temperature Coefficient of Current Source

MANUAL

for

IPC/1 Power Relay module 6023p

Dansk Data Elektronik A/S

Juni 1985.

Forfatter: Allan Petersen

Juni 1985

Indholdsfortegnelse:

Introduktion.

IPC/1 6023p modulet er et digital output kort med 8 kanaler, og indeholder 8 monostabile relæer med sluttekontakter (enkelte). De 8 outputs er indbyrdes galvanisk adskilte, og outputsiden er isoleret fra processorstel; isolations-spændingen er 1500 V DC. Ved power-off eller reset vil alle relæer starte i en veldefineret tilstand, idet kontakterne vil være åbne.

Relækontakterne har følgende elektriske data:

Maksimal spænding	:	110 V AC/DC
Maksimal strøm	:	2 A
Maksimal brydeeffekt	:	30 VA

Udgangene kan forsynes med et RC led som gnistslukker; der kan evt. yderligere tilføjes varistorer over kontakterne.

På kortet er monteret 8 lysdioder, der indikerer relæernes stilling. Desuden kan relæstillingen kontrollæses af CPU'en, dog ikke over kontaktsættet, men via styreregisteret.

Tilslutning til periferien foretages via Europakonnektor DIN 41612, byggeform B, 64 polet hanstik.

Funktionel beskrivelse.

Kortet er opbygget med en 8 bit latch til udlæsning af et relæ setting ord. Latchen er efterfulgt af relædriver IC'er til at aktivere trækspolerne.
Relæernes sluttekontakt er aktiveret sålænge latchens tilsvarende kanal bit er sat. Latchindholdet kan via en buffer kontrollæses af CPU'en.

Latchen resettes ved power-up.

Manøvreringstid for relæerne er min. 3 mS.

Kortet anvender den sædvanlige IPC adresseringsmetode med IO-adresse og type-adresse; se desuden side 5.

Kortet optager en I/O adresse; basisadressen sættes på kortet på et switch register. Den til kortet hørende type-adresse (TYPE = 3) er fast kodet i printet.

Adressering:

I/O ADRESSER:

Switch på kortet stilles til (n):

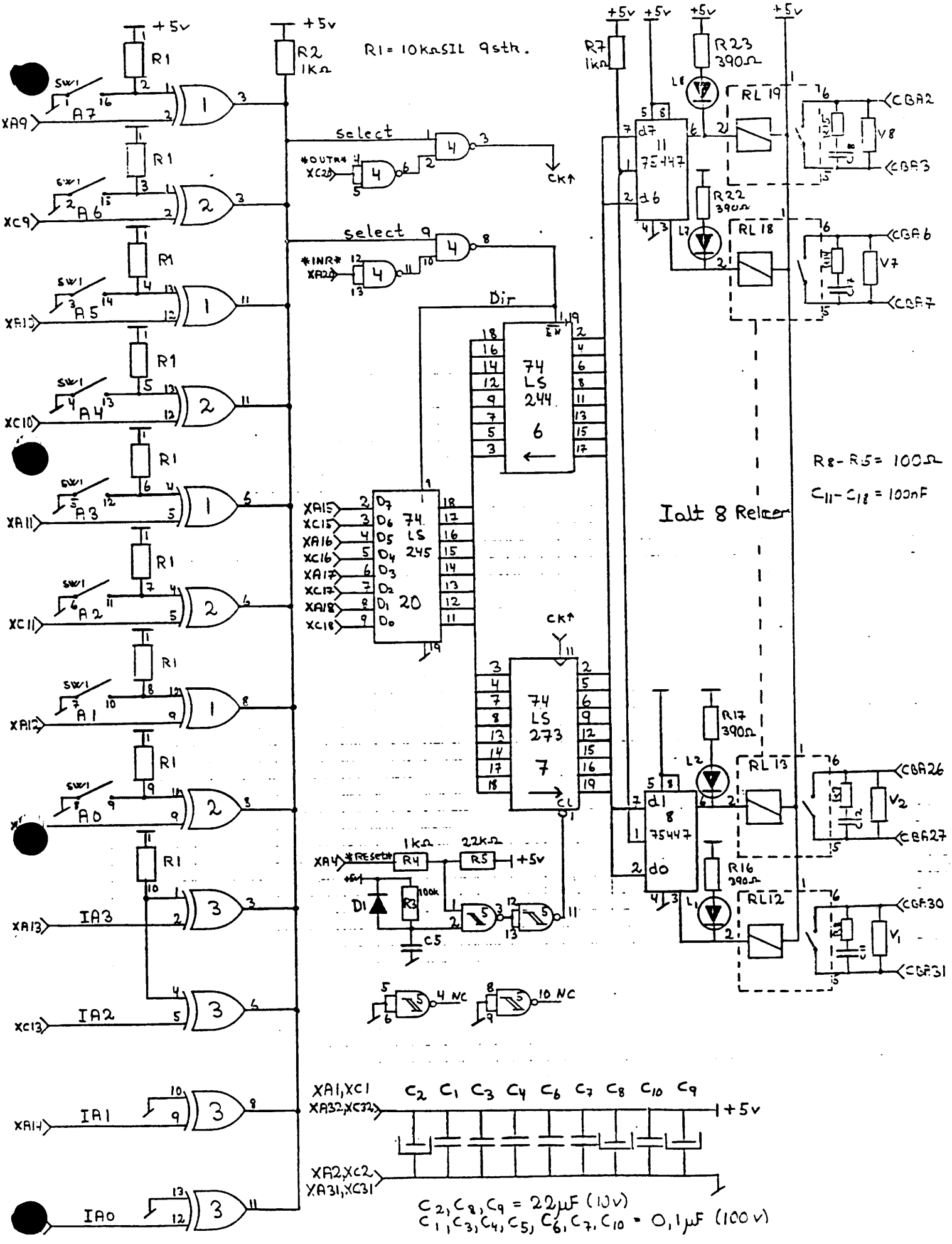
		Bit7							Bit0
IN (n):	Læs Relæ stilling:	D7	D6	D5	D4	D3	D2	D1	D0
OUT (n):	Sæt Relæ stilling:	D7	D6	D5	D4	D3	D2	D1	D0

hvor:

D7	svarer til relæ 8 (Ch 8)
D6	svarer til relæ 7 (Ch 7)
D5	svarer til relæ 6 (Ch 6)
D4	svarer til relæ 5 (Ch 5)
D3	svarer til relæ 4 (Ch 4)
D2	svarer til relæ 3 (Ch 3)
D1	svarer til relæ 2 (Ch 2)
D0	svarer til relæ 1 (Ch 1)

Bit DX sat => Pågældende relæ trukket => Relækontakt sluttet.

TYPE = 3.



Type 3

22-05-84 IPC 6023P-1

Komponentliste:

Komponentliste IPC 6023p

Navn	Komponent	pins	Fabrikat
IC1	74LS136N	14	Texas
IC2	74LS136N	14	Texas
IC3	74LS136N	14	Texas
IC4	74LS00N	14	Texas
IC5	HEF4093BP	14	Philips
IC6	74LS244N	20	Texas
IC7	74LS273N	20	Texas
IC8	SN75447P	8	Texas
IC9	SN75447P	8	Texas
IC10	SN75447P	8	Texas
IC11	SN75447P	8	Texas
IC20	74LS245N	20	Texas
RL12	Relæ V23040-A0001-B201		Siemens
RL13	Relæ V23040-A0001-B201		Siemens
RL14	Relæ V23040-A0001-B201		Siemens
RL15	Relæ V23040-A0001-B201		Siemens
RL16	Relæ V23040-A0001-B201		Siemens
RL17	Relæ V23040-A0001-B201		Siemens
RL18	Relæ V23040-A0001-B201		Siemens
RL19	Relæ V23040-A0001-B201		Siemens
D1	Diode 1N4148		
L1	Led (enkelte, men af modulstakbar type)		
L2	Led (enkelte, men af modulstakbar type)		
L3	Led (enkelte, men af modulstakbar type)		
L4	Led (enkelte, men af modulstakbar type)		
L5	Led (enkelte, men af modulstakbar type)		
L6	Led (enkelte, men af modulstakbar type)		
L7	Led (enkelte, men af modulstakbar type)		
L8	Led (enkelte, men af modulstakbar type)		
V1	Varistor VARISTORER		G.E.

V2	Varistor	MONTERES	G.E.
V3	Varistor	KUN	G.E.
V4	Varistor	SOM	G.E.
V5	Varistor	SPECIEL	G.E.
V6	Varistor	OPTION	G.E.
V7	Varistor	D.V.S.	G.E.
V8	Varistor	foreløbig ikke!	G.E.

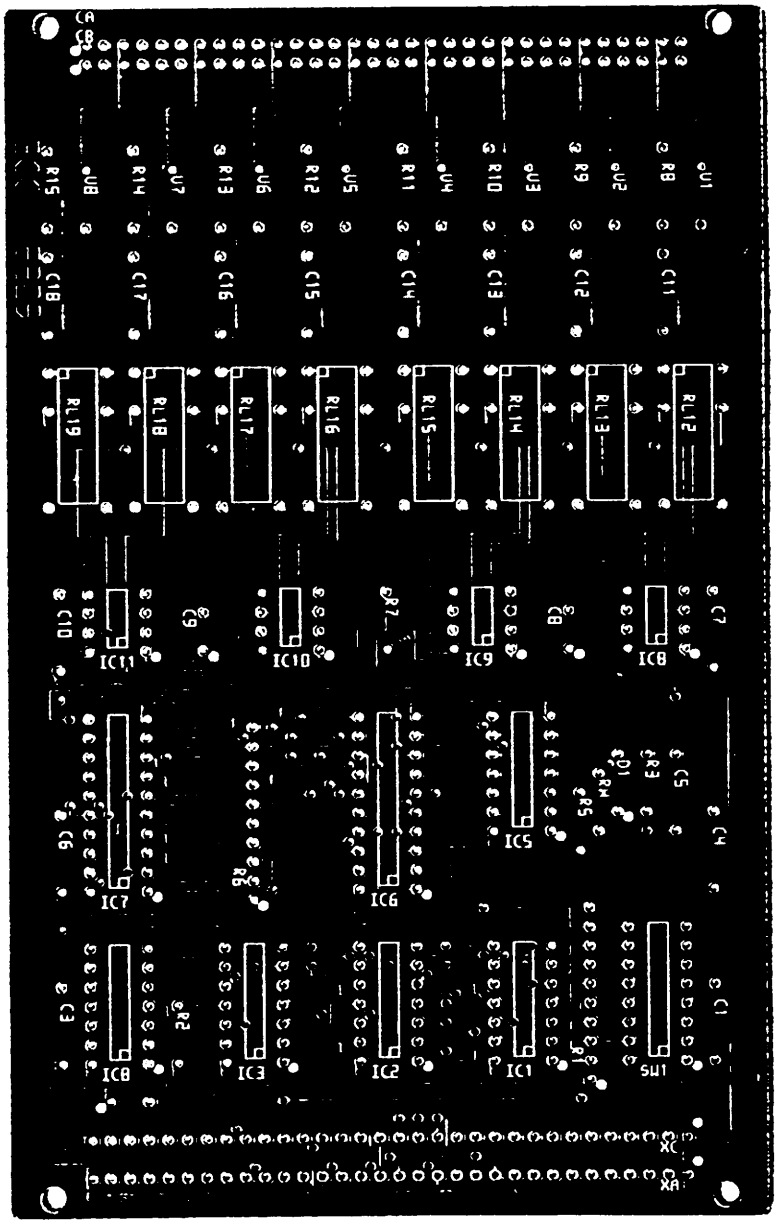
R1	SIL modstande 9x10k	
R2	Modstand 1k	
R3	Modstand 100k	
R4	Modstand 1k	
R5	Modstand 22k	
R7	Modstand 1k	
R8 - 15	Modstand 100 ohm	
R16 - 23	Modstand 390 ohm	

C1	Afkobling 100 nF	Siemens
C2	22 uF, 10 V Sol.Al	Philips
	(Philips kodenr. 2222 122 54229)	
C3	Afkobling 100 nF	Siemens
C4	Afkobling 100 nF	Siemens
C5	Konds 100 nF	Siemens
C6	Afkobling 100 nF	Siemens
C7	Afkobling 100 nF	Siemens
C8	22 uF, 10 V Sol.Al	Philips
C9	22 uF, 10 V Sol.Al	Philips
C10	Afkobling 100 nF	Siemens
>OPTION C11	Konds 100 nF	Siemens
>OPTION C12	Konds 100 nF	Siemens
>OPTION C13	Konds 100 nF	Siemens
>OPTION C14	Konds 100 nF	Siemens
>OPTION C15	Konds 100 nF	Siemens
>OPTION C16	Konds 100 nF	Siemens
>OPTION C17	Konds 100 nF	Siemens
>OPTION C18	Konds 100 nF	Siemens

SW1	DIL switch, 8 switches

XA/XC	Euro-connector 64 pins (a og c)
CA/CB	Euro-connector 64 pins (a og b)

Komponentplacering:



Forbindelser til stik:

Pin:	a	b
1	NC.	NC.
2	Ch. 8 (SL)	Ch. 8 (SL)
3	Ch. 8 (Kontakt)	Ch. 8 (Kontakt)
4	NC.	NC.
5	NC.	NC.
6	Ch. 7 (SL)	Ch. 7 (SL)
7	Ch. 7 (Kontakt)	Ch. 7 (Kontakt)
8	NC.	NC.
9	NC.	NC.
10	Ch. 6 (SL)	Ch. 6 (SL)
11	Ch. 6 (Kontakt)	Ch. 6 (Kontakt)
12	NC.	NC.
13	NC.	NC.
14	Ch. 5 (SL)	Ch. 5 (SL)
15	Ch. 5 (Kontakt)	Ch. 5 (Kontakt)
16	NC.	NC.
17	NC.	NC.
18	Ch. 4 (SL)	Ch. 4 (SL)
19	Ch. 4 (Kontakt)	Ch. 4 (Kontakt)
20	NC.	NC.
21	NC.	NC.
22	Ch. 3 (SL)	Ch. 3 (SL)
23	Ch. 3 (Kontakt)	Ch. 3 (Kontakt)
24	NC.	NC.
25	NC.	NC.
26	Ch. 2 (SL)	Ch. 2 (SL)
27	Ch. 2 (Kontakt)	Ch. 2 (Kontakt)
28	NC.	NC.
29	NC.	NC.
30	Ch. 1 (SL)	Ch. 1 (SL)
31	Ch. 1 (Kontakt)	Ch. 1 (Kontakt)
32	NC.	NC.

Forbindelser til bus:

Pin:	a	c
1	+ 5 V	+ 5 V
2	GND	GND
3		
4	*RESET*	
5		
6		
7		
8		
9	A7	A6
10	A5	A4
11	A3	A2
12	A1	A0
13	IA3	IA2
14	IA1	IA0
15	D7	D6
16	D5	D4
17	D3	D2
18	D1	D0
19		
20	*INR*	*OUTR*
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31	GND	GND
32	+ 5 V	+ 5 V

Testbeskrivelse:

Til test af Relækortet findes:

- En testboks, der kan indskydes mellem output konnektoren og periferikablet, hvorved boksen dels kan vise tilstanden af relæudgangene, dels kan påtrykke periferi-siden et ønsket manøvresignal.

- Et testprogram, der sekventielt aktiverer de enkelte relæer, og foretager kontrollæsning af relæsettingen.

SERIES 75446
DUAL PERIPHERAL DRIVERS

BULLETIN NO. DL-S 12630, DECEMBER 1978 – REVISED NOVEMBER 1980

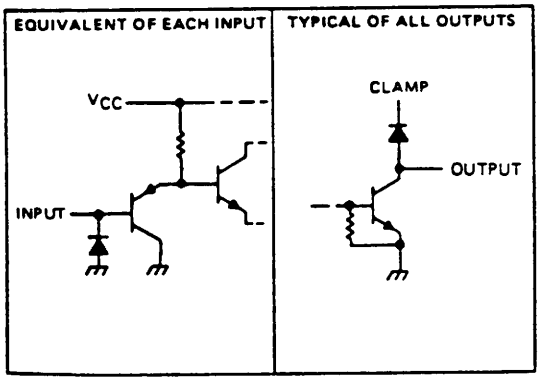
- Very Low Power Requirements
- Very Low Input Current
- Characterized for Use to 350 mA
- No Output Latch-Up at 50 V (After Conducting 300 mA)
- High-Voltage Outputs (70 V Min)
- Output Clamp Diodes for Transient Suppression (350 mA, 70 V)
- TTL- or MOS-Compatible Diode-Clamped Inputs
- Standard Supply Voltage
- Suitable for Hammer-Driver Applications

description

Series 75446 dual peripheral drivers are designed for use in systems that require high current, high voltage, and fast switching times. The SN75446, SN75447, SN75448, and SN75449 provide AND, NAND, OR, and NOR drivers, respectively. These devices have diode-clamped inputs as well as high-current, high-voltage inductive-clamp diodes on the outputs.

Series 75446 drivers are characterized for operation from 0°C to 70°C.

schematics of inputs and outputs

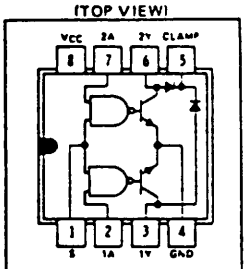


SN75446
FUNCTION TABLE
(EACH AND DRIVER)

INPUTS		OUTPUT
A	S	Y
L	L	L
L	H	L
H	L	L
H	H	H

H = high level
L = low level

JG OR P DUAL-IN-LINE PACKAGE
(TOP VIEW)



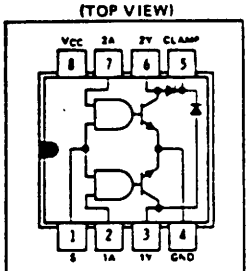
positive logic: Y = AS

SN75447
FUNCTION TABLE
(EACH NAND DRIVER)

INPUTS		OUTPUT
A	S	Y
L	L	H
L	H	H
H	L	H
H	H	L

H = high level
L = low level

JG OR P DUAL-IN-LINE PACKAGE
(TOP VIEW)



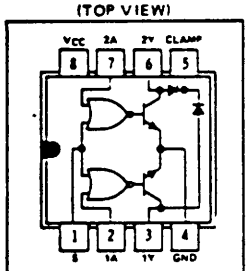
positive logic: Y = $\overline{AS}$

SN75448
FUNCTION TABLE
(EACH OR DRIVER)

INPUTS		OUTPUT
A	S	Y
L	L	L
L	H	H
H	L	H
H	H	H

H = high level
L = low level

JG OR P DUAL-IN-LINE PACKAGE
(TOP VIEW)



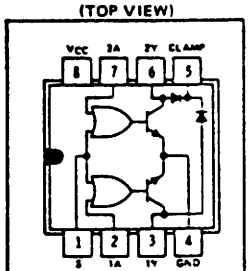
positive logic: Y = A + S

SN75449
FUNCTION TABLE
(EACH NOR DRIVER)

INPUTS		OUTPUT
A	S	Y
L	L	H
L	H	L
H	L	L
H	H	L

H = high level
L = low level

JG OR P DUAL-IN-LINE PACKAGE
(TOP VIEW)



positive logic: Y = $\overline{A + S}$

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1) . . . . . 7 V
Input voltage . . . . . 5.5 V
Output current (see Note 2) . . . . . 400 mA
Output clamp diode current . . . . . 400 mA
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 3):
JG package . . . . . 825 mW
P package . . . . . 1000 mW
Operating free-air temperature . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: JG package . . . . . 300°C
Lead temperature 1/16 inch from case for 10 seconds: P package . . . . . 260°C

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.75	5	5.25	V
Operating free-air temperature	0		70	°C

NOTES: 1. Voltage values are with respect to network ground terminal.
2. Both halves of this dual circuit may conduct rated current simultaneously; however, power dissipation averaged over a short time interval must fall within the continuous dissipation ratings.
3. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 11. In the JG package, SN75446 through SN75449 chips are glass-mounted.

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER			TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{IH}	High-level input voltage				2			V
V_{IL}	Low-level input voltage						0.8	V
V_{IK}	Input clamp voltage		I_I = −12 mA			−0.9	−1.5	V
I_{OH}	High-level output current		V_{CC} = 4.75 V, V_{IH} = 2 V, V_{IL} = 0.8 V, V_{OH} = 70 V			1	100	μA
V_{OL}	Low-level output voltage		V_{CC} = 4.75 V, V_{IH} = 2 V, V_{IL} = 0.8 V	I_{OL} = 100 mA		0.10	0.3	V
				I_{OL} = 200 mA		0.22	0.45	
				I_{OL} = 300 mA		0.45	0.65	
				I_{OL} = 350 mA		0.55	0.75	
$V_{(BR)O}$	Output breakdown voltage		V_{CC} = 4.75 V, I_{OH} = 100 μA		70	100		V
$V_{R(K)}$	Output clamp diode reverse voltage		V_{CC} = 4.75 V, I_R = 100 μA		70	100		V
$V_{F(K)}$	Output clamp diode forward voltage		V_{CC} = 4.75 V, I_F = 350 mA		0.6	1.2	1.6	V
I_{IH}	High-level input current		V_{CC} = 5.25 V, V_I = 5.25 V			0.01	10	μA
I_{IL}	Low-level input current	A input	V_{CC} = 5.25 V, V_I = 0.8 V			−0.5	−10	μA
		Strobe S				−1	−20	
I_{CCH}	Supply current, outputs high	SN75446	V_{CC} = 5.25 V,	V_I = 5 V		11	18	mA
		SN75447		V_I = 0		11	18	
		SN75448		V_I = 5 V		18	25	
		SN75449		V_I = 0		18	25	
I_{CCL}	Supply current, outputs low	SN75446	V_{CC} = 5.25 V	V_I = 0		11	18	mA
		SN75447		V_I = 5 V		11	18	
		SN75448		V_I = 0		18	25	
		SN75449		V_I = 5 V		18	25	

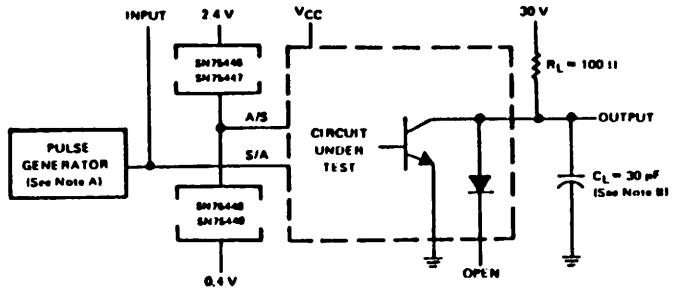
†All typical values are at V_{CC} = 5 V, T_A = 25°C.

TEXAS INSTRUMENTS
INCORPORATED
POST OFFICE BOX 225012 • DALLAS, TEXAS 75265

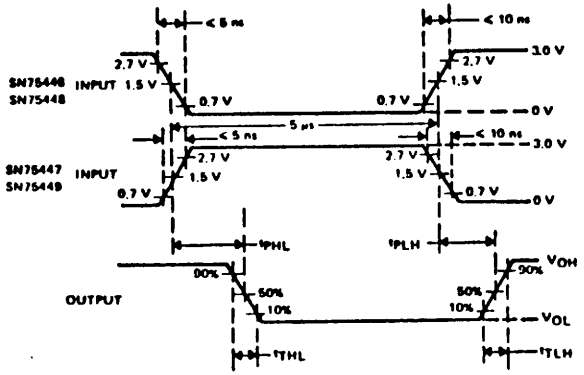
switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS	SN75446			SN75447			SN75448			SN75449			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH}	Propagation delay time, low-to-high-level output	C_L = 30 pF, R_L = 100 Ω, See Figure 1		300	750		300	750		300	750		300	750	ns
t_{PHL}	Propagation delay time, high-to-low-level output			200	600		200	600		200	500		200	500	ns
t_{TLH}	Transition time, low-to-high-level output			50	100		50	100		50	100		50	100	ns
t_{THL}	Transition time, high-to-low-level output			50	100		50	100		50	100		50	100	ns
V_{OH}	High-level output voltage after switching	V_S = 55 V, I_O = 300 mA, See Figure 2	V_S−18			V_S−18			V_S−18			V_S−18			mV

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A. The pulse generator has the following characteristics: PRR = 100 kHz, Z_{out} = 50 Ω.
B. C_L includes probe and jig capacitance.

FIGURE 1–SWITCHING CHARACTERISTICS

Kleinrelais D1 für Gleichspannung, gepolt, mono- und bistabil

Mit dem Kleinrelais D1 ist eine optimale Anpassung an die unterschiedlichsten Schaltungsbedingungen gegeben. Es entspricht auch den Anforderungen der hochintegrierten Halbleitertechnik. Die Einsatzmöglichkeiten des Kleinrelais D1 liegen in Bereichen wie Meßtechnik, Steuer-, Regel- und Prozeßtechnik, Unterhaltungselektronik, Nachrichtentechnik, Signaltechnik und Medizinische Technik. Das Kleinrelais D1 findet Anwendung u.a. als Koppel- und Verknüpfungselement innerhalb elektronischer Baugruppen, als Schnittstellenrelais für Mikrocomputer-Systeme, als Speicherelement für analoge Ein- und Ausgabegeräte etc.

Das Kleinrelais D1 ist mit 1 Wechsler, dessen Kontakte als Doppelkontakte ausgeführt sind, bestückt.

Das Relaissystem ist in Gießharz eingebettet und mit einer metallischen Kappe geschützt.

Das Kleinrelais D1 ist auf Dichtigkeit entsprechend DIN 40046, Blatt 15, Qc 2 geprüft.

Kleinrelais D1 mit Doppelkontakten, für Einbau in gedruckte Schaltungen. Anschlüsse für Rasterteilung 2,5 mm sowie 2,54 mm nach DIN 40801 und DIN 40803, fein.

Kleinrelais D1 V23040-A0... monostabil, mit 1 Wicklung

Kleinrelais D1 V23040-C0 ... bistabil, mit 1 Wicklung

Kleinrelais D1 V23040-B0... bistabil, mit 2 Wicklungen

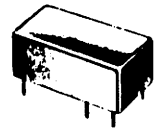
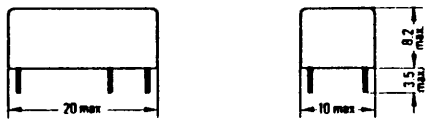
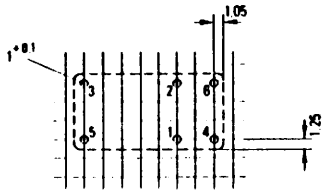


Abbildung etwa Originalgröße

Gewicht etwa 6 g



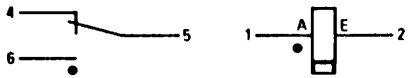


Montagelochung
Ansicht auf die Anschlüsse

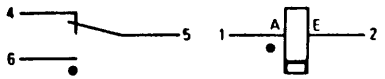
Toleranzen der Bohrungsabstände ±0,2 mm
Eine Montage ohne Abstand zwischen den Relais ist zulässig.

Anschlußbelegung

V23040-A0... monostabil

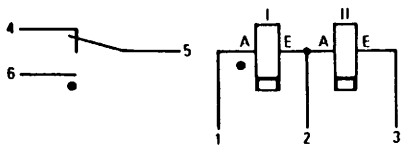


V23040-C0 . . . bistabil



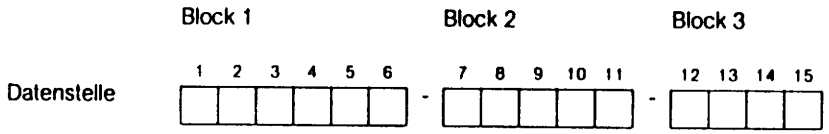
Ruhestellung entspricht gezeichneter Schaltstellung.
Liegt am Wicklungsanfang Plus-Potential, nimmt das Relais die Arbeitsstellung ein.

V23040-B0... bistabil



Ruhestellung entspricht gezeichneter Schaltstellung. Liegt am Anschluß 1 Minus-Potential oder am Anschluß 3 Plus-Potential gegenüber dem Anschluß2, nimmt das Relais die Ruhestellung ein. Liegt am Anschluß 1 Plus-Potential oder am Anschluß 3 Minus-Potential gegenüber dem Anschluß 2, nimmt das Relais die Arbeitsstellung ein.

Bestellbezeichnung



Block 1 Datenstelle 1
2
3
4
5
6
Block 2 Datenstelle 7
8
} Kennzeichen der Relaisausführung V23040-.. siehe Seite 7.3

9
10
11
} Nummer der Spule siehe Tabelle 7.2

Block 3 Datenstelle 12
13
14
15
} Kontaktausführung siehe Tabelle 7.1

Bestellbeispiel:

Kleinrelais D1, Spule mit 1 Wicklung, bistabil, 12 V Nennspannung, Kontaktwerkstoff Gold

V 2 3 0 4 0 - C 0 0 5 2 - B 1 0 1

Vorzugsbauvorschriften

V23040-A0001-B201
-A0002-B201
-A0003-B201
-A0004-B201

V23040-B0101-B201
-B0102-B201
-B0103-B201
-B0104-B201

V23040-C0051-B201
-C0052-B201
-C0053-B201
-C0054-B201

Tabelle 7.1 Kennwerte

Erregerseite

Betriebsspannungen	V–	siehe Tabelle 7.2
Nennleistung	mW	50 bis 200[1])
Zulässige Umgebungstemperatur bei Betriebsleistung	°C	–40 bis +70
Obere Grenztemperatur	°C	85
Thermische Dauerbelastbarkeit bei 20 °C Umgebungstemperatur	mW	850
Wärmewiderstand bei therm. Dauerbelastbarkeit	K/W	75
Ansprechzeit[2])	ms	etwa 2
Rückfallzeit[2])	ms	etwa 0,6
Prellzeit	ms	< 1
Höchste Schalthäufigkeit	Schaltspiele/s	100
Prüfspannung Kontakt/Wicklung Wicklung/Kappe	$V\sim_{eff}$ $V\sim_{eff}$	1500 1000

Kontaktseite

Bestellbezeichnung Block 3		B201	B101
Kontaktwerkstoff		Rhodium	Gold
Kontaktbezeichnung		21	
Schaltzeichen (siehe auch Anschlußbelegung)			
Schaltspannung max.	V– V~	150 125	36 30
Schaltstrom max.	A	2	0,1
Schaltleistung max. bei Gleichspannung bei Wechselspannung	W VA	35 bis 60 siehe Bild 7.1 (spannungs- abhängig) 60	3 3
Grenzdauerstrom	A	2	
Kontaktkraft	cN	etwa 7	
Prüfspannung offener Kontakt/geschl. Kontakt Kontakt/Kappe	 $V\sim_{eff}$ $V\sim_{eff}$	 500 1000	
Kontaktkapazitätswerte max. offener Kontakt/geschl. Kontakt	pF	etwa 5	
Mechanische Lebensdauer	Schaltspiele	etwa 10^8	

[1]) Je nach Ausführung und Spule
[2]) Gemessen bei Nennspannung ohne Vorwiderstand

Tabelle 7.2 Betriebsspannungsbereich und Spulenausführungen

Nenn-spannung V–	Wicklung	Betriebs-spannungs-Bereich bei 20 °C Minimal-spannung U_I V–	Maximal-spannung U_{II} V–	Widerstand bei 20 °C Ω	Win-dungen	Nummer der Spule Bestellbez. Block 2
für V23040-A0...						
5		3,75	16,5	320 ± 32	3000	001
12		9	30	1140 ± 170	5500	002
15		11,25	38	1850 ± 275	7000	003
24		18	60	4370 ± 650	10600	004
für V23040-B0...						
5	I	3,75	16	315 ± 47	2150	101
	II	3,75	16	315 ± 47	2000	
12	I	9	30	1110 ± 165	3950	102
	II	9	30	1110 ± 165	3750	
15	I	11,25	37	1760 ± 265	4950	103
	II	11,25	37	1760 ± 265	4800	
24	I	18	46	2800 ± 420	6700	104
	II	18	46	2800 ± 420	5200	
für V23040-C0...						
5		3,75	20	500 ± 75	3700	051
12		9	38	1850 ± 275	7000	052
15		11,25	48	2850 ± 425	8750	053
24[1])		18	67	5650 ± 845	12000	054

Die angegebenen Spannungsbereiche gelten nur bei Ansteuerung jeweils einer Wicklung.

Die Betriebsspannungsgrenzwerte U_I und U_{II} sind temperaturabhängig nach den Formeln:

$U_{I\,tu} = k_I \cdot U_{I\,20\,°C}$ und $U_{II\,tu} = k_{II} \cdot U_{II\,20\,°C}$

t_u = Umgebungstemperatur

$U_{I\,tu}$ = Minimalspannung bei Umgebungstemperatur t_u

$U_{II\,tu}$ = Maximalspannung bei Umgebungstemperatur t_u

k_I und k_{II} = Faktoren

t_u	-40 °C	-30 °C	20 °C	-10 °C	0 °C	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C
k_I	1	1	1	1	1	1	1,02	1,04	1,06	1,08	1,1
k_{II}	1,39	1,33	1,27	1,21	1,14	1	0,92	0,83	0,73	0,62	0,48

Die Summe aus Umgebungstemperatur und Übertemperatur in der Spule darf 85 °C nicht überschreiten.

Die maximale Betriebsspannung ist so berechnet, daß unter Berücksichtigung des Faktors k_{II} diese maximal zulässige Temperatur bei Dauerbetrieb am Relais nicht überschritten wird.

[1]) Dauererregung mit Nennspannung nur bis zur Umgebungstemperatur 60 °C zulässig

Lastgrenzkurve

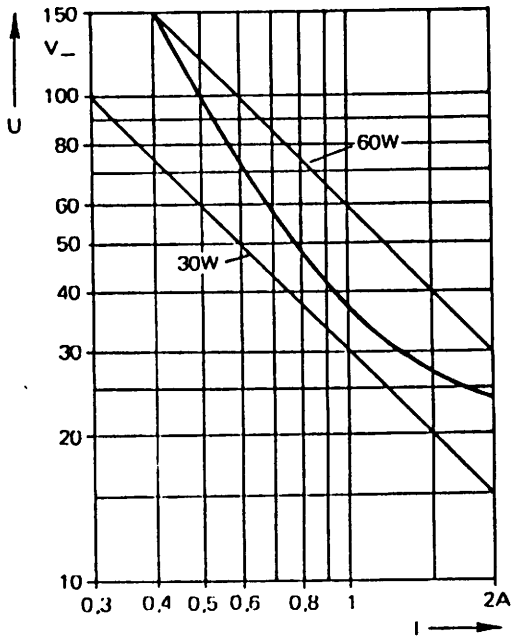


Bild 7.1

I – Schaltstrom
U – Schaltspannung

Sicheres Abschalten, kein stehender Lichtbogen
——— Kontaktwerkstoff Rhodium

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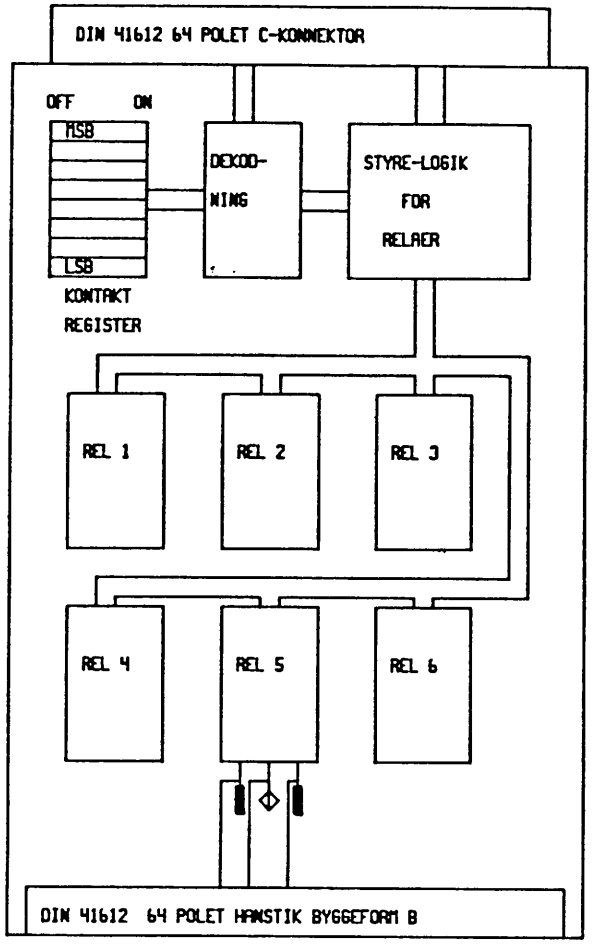
9. IPC 6051 digitalt output modul.

Dette afsnit beskriver den hardwaremæssige opbygning af 6051 modulet. Endvidere beskrives adressering af modulet og den komplette snitflade for periferien.

9.1 Funktionel beskrivelse.

Modulet indeholder 6 bistabile relæer med 2 skiftekontaktsæt, hvoraf det ene kontaktsæt anvendes til kontrol. Udgangen fra de aktive kontaktsæt udgøres af midterben,setkontakt og resetkontakt. På kortet er desuden monteret 6 lysdioder, som viser status for det andet kontaktsæt. Dioderne tændes når midterbenet er forbundet til setkontakten. Et skematisk diagram af modulet er vist i efterfølgende figur.



IPC 6051 OUTPUT MODUL

Relæerne har følgende elektriske data:

Maksimal spænding	110 V AC/DC
Maksimal strøm	2 A
Maksimal efekt	30 W

9.2 Adressering.

Kortet anvender 1 i/o adresse på i/o type 1. Adressen stilles på switchregisteret med mest betydende bit anbragt nærmest europakonnektoren.

Ved skrivning indsættes akkumulatoren i et styreregister på kortet. De enkelte bit i styreregisteret har følgende betydning:

bit 7	1= udfør set operation
bit 6	1= udfør reset operation
bit 5-	
bit 0	1= selekter relæ. Bit 5 styrer relæ nr. 6 og bit 0 styrer relæ nr. 1 .

Logisk set opfører relæet sig som en SR-vippe. Kombinationen bit 7=1 og bit 6=1 er ulovlig og fører til et uforudsigeligt resultat. Flere relæer kan manøvreres i samme ordre, men funktionen må enten være reset eller set.

Ved læsning af i/o adressen fås følgende information:

bit 7	Altid på logisk 0
bit 6	0 hvis topkonnektor er monteret
bit 5-	
bit 0	status for det andet kontaktsæt bit 5 angiver status for relæ 1 og bit 0 angiver status for relæ 6. Status er 1 hvis det pågældende relæ er sat. Statusindikationen er prelsikret og latchet. Status sættes først når den aktuelle kontakt forbindes til midterbenet.

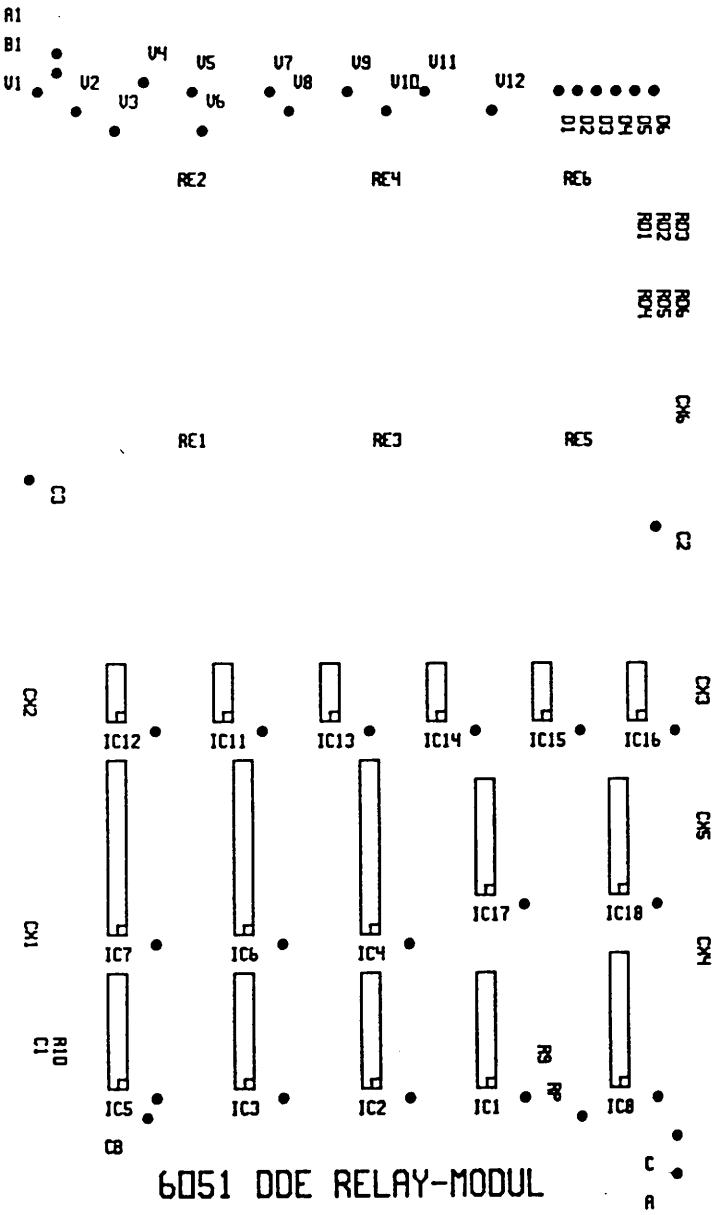
9.3 Topkonnektor.

Konnektortype: DIN 41612, byggeform B, 64 polet hanstik .

pin	a	b
1	S1	S1
2	C1	C1
3	R1	R1
4	-	-
5	S2	S2
6	C2	C2
7	R2	R2
8	-	-
9	S3	S3
10	C3	C3
11	R3	R3
12	-	-
13	S4	S4
14	C4	C4
15	R4	R4
16	-	-
17	S5	S5
18	C5	C5
19	R5	R5
20	-	-
21	S6	S6
22	C6	C6
23	R6	R6
24	-	-
25	-	-
26	-	-
27	-	-
28	-	-
29	-	-
30	+5V	+5V
31	0 V	0 V
32	TOP	TOP

Sn,Cn,Rn angiver setkontakt,midterben hhv. resetkontakt på relæ nr. n. Signalet TOP skal forbindes til 0 V i topkonnektoren af brugeren til indikering af, om stikket er sat på.

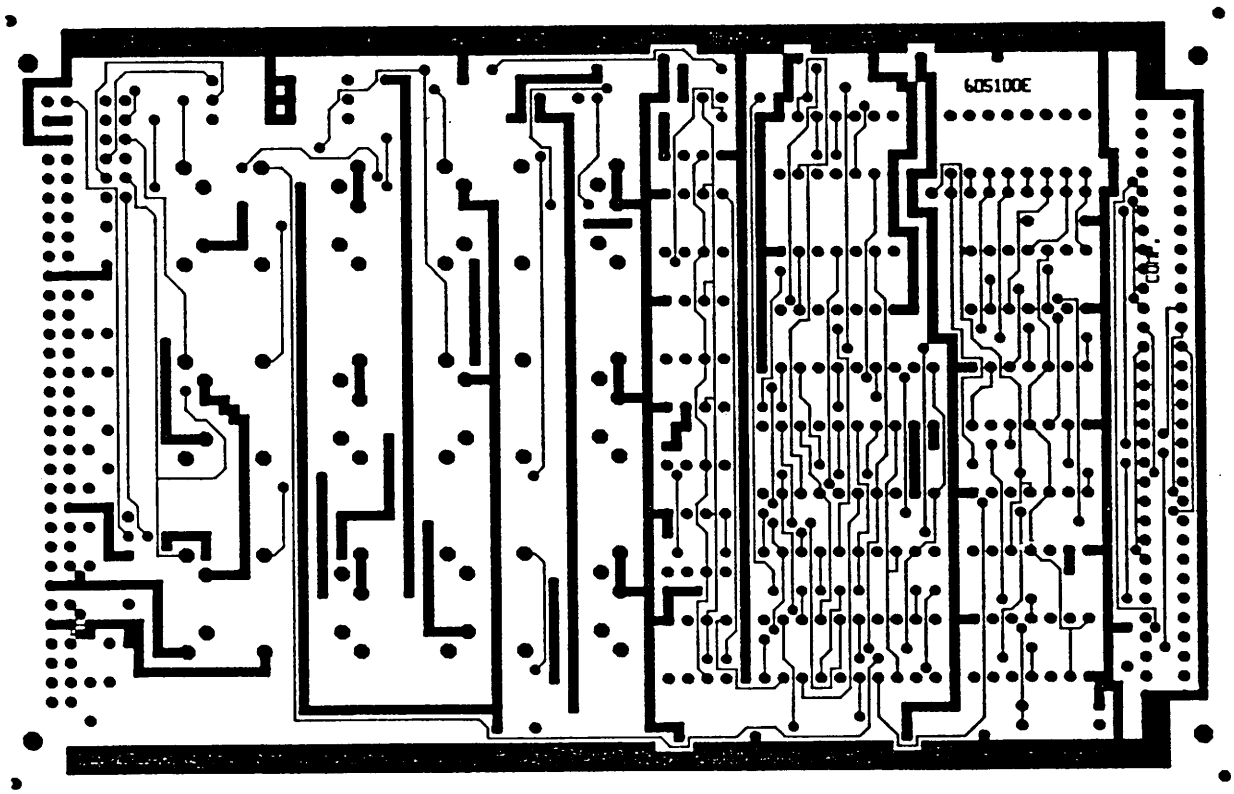
9.4 Komponentplacering IPC 6051

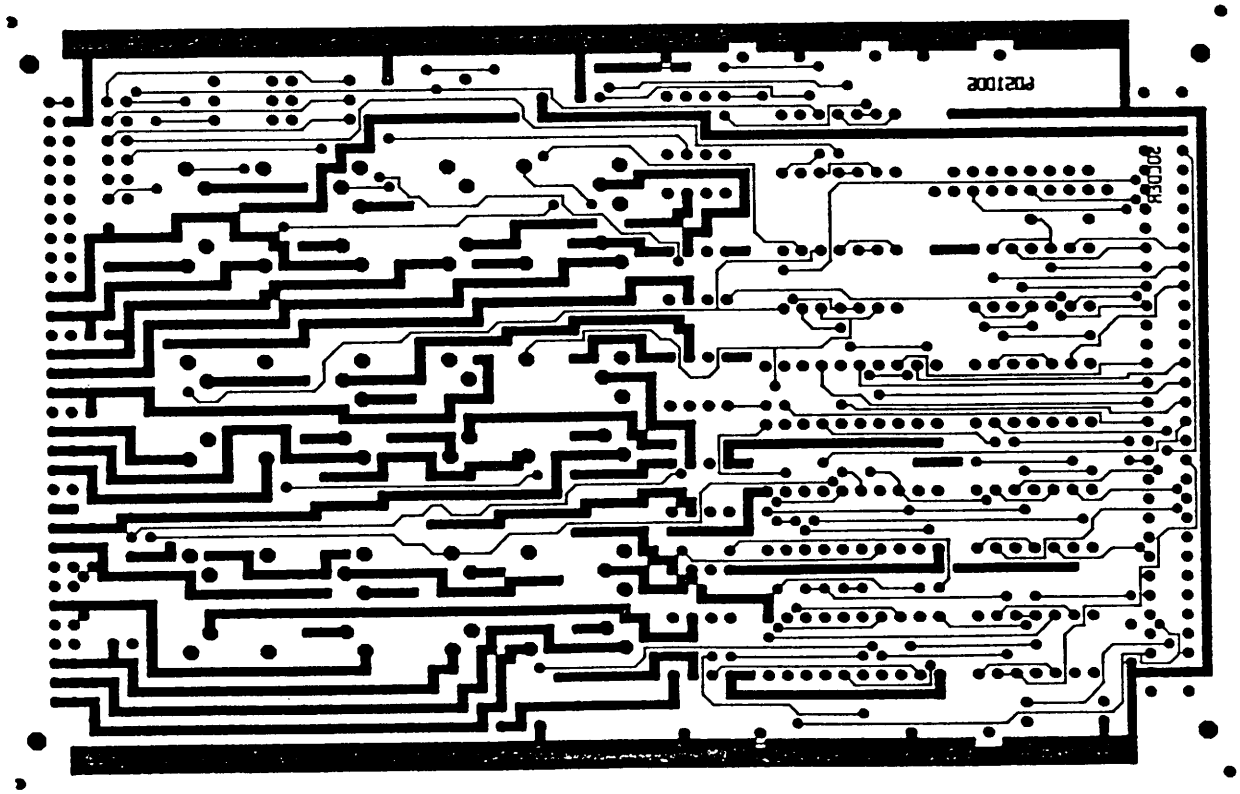


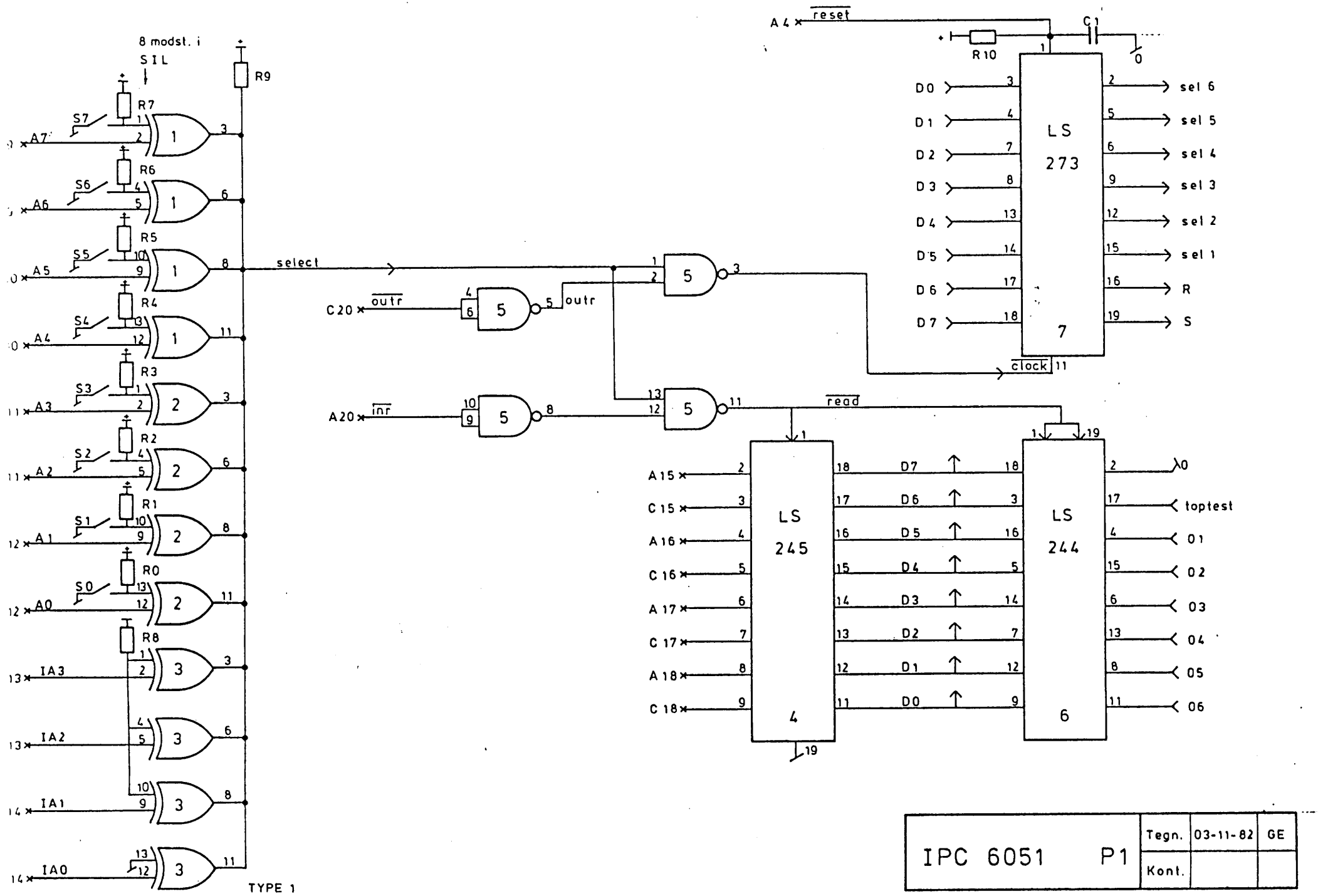
9.5 Komponentliste IPC 6051.

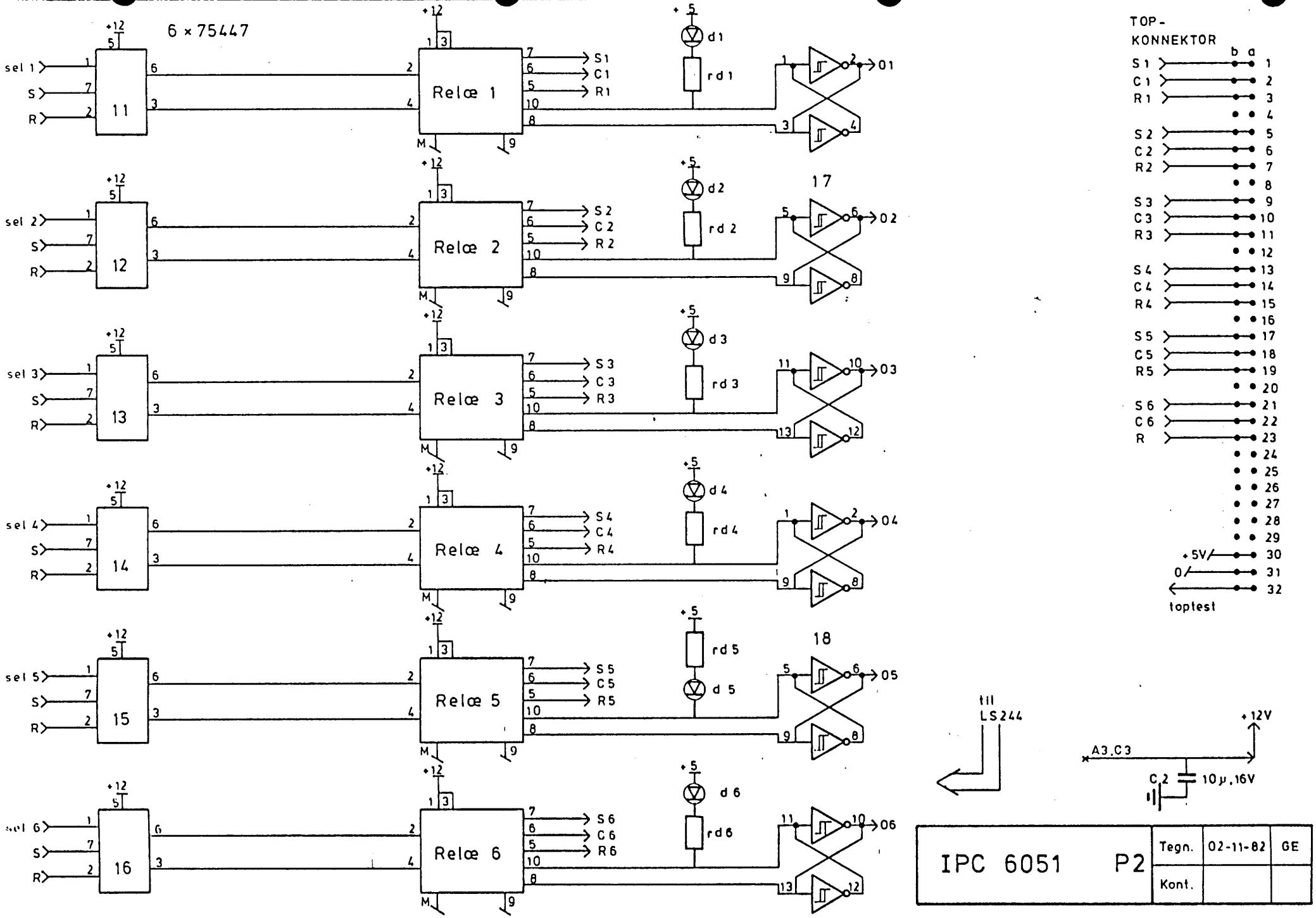
IC1	SN74LS136
IC2	SN74LS136
IC3	SN74LS136
IC4	SN74LS245
IC5	SN74LS00
IC6	SN74LS244
IC7	SN74LS273
IC8	DIL switch, 8 kontakter
IC11-IC16	SN75447
IC17	SN74LS14
IC18	SN74LS14
RE1-RE6	Bistabilt relæ V23015-A0117
RD1-RD6	390 ohm formodstane for LED
D1-D6	LED (modulstakbare)
RP	3K3 pull up i SIL
R9	1K Pull up
R10	10K
C1	0.1uF
C2	10u,16 V tantal
CX	Afkobling 0.1uF
V1-V12	Variastorer, kun som option
Topkonnektor:	DIN 41612, byggeform B, 64 polet hanstik.

9.6 Print layout IPC 6051.






8 modst. i
SIL
R9
R7
S7
A7
R6
S6
A6
R5
S5
A5
R4
S4
A4
R3
S3
A3
R2
S2
A2
R1
S1
A1
R0
S0
A0
R8
IA3
IA2
IA1
IA0
TYPE 1
select
C20
outr
outr
A20
inr
A4
reset
R10
C1
LS 273
D0
D1
D2
D3
D4
D5
D6
D7
sel 6
sel 5
sel 4
sel 3
sel 2
sel 1
R
S
clock
read
LS 245
A15
C15
A16
C16
A17
C17
A18
C18
LS 244
toptest
01
02
03
04
05
06
IPC 6051 P1
Tegn.
03-11-82
GE
Kont.

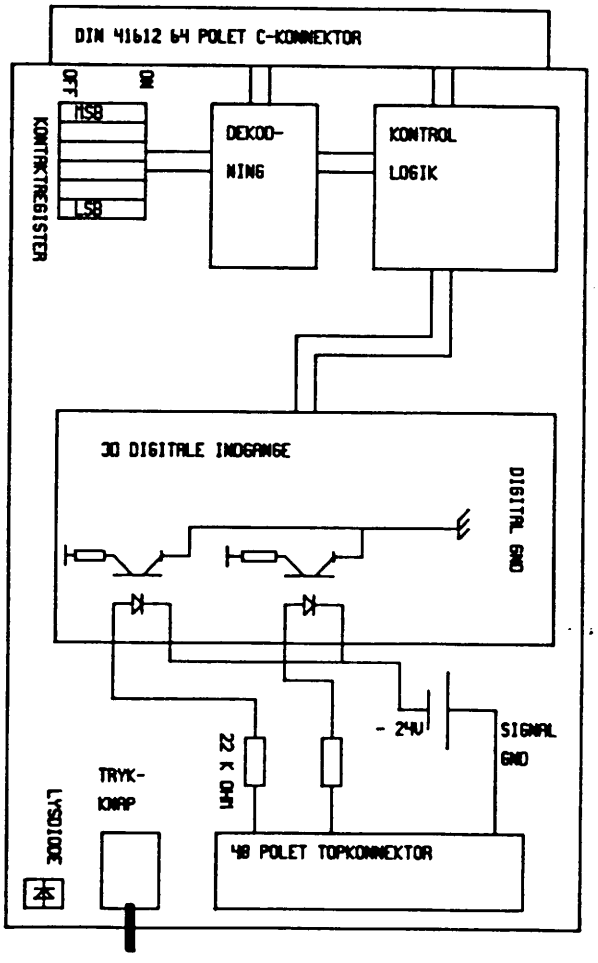

6 x 75447
sel 1
sel 2
sel 3
sel 4
sel 5
sel 6
S
R
11
12
13
14
15
16
Relæ 1
Relæ 2
Relæ 3
Relæ 4
Relæ 5
Relæ 6
S1
C1
R1
S2
C2
R2
S3
C3
R3
S4
C4
R4
S5
C5
R5
S6
C6
R6
d1
d2
d3
d4
d5
d6
rd1
rd2
rd3
rd4
rd5
rd6
01
02
03
04
05
06
17
18
TOP-
KONNEKTOR
b a
S1
C1
R1
S2
C2
R2
S3
C3
R3
S4
C4
R4
S5
C5
R5
S6
C6
R
+5V
0
toptest
til
LS244
+12V
A3,C3
C,2
10µ,16V
IPC 6051 P2
Tegn.
02-11-82
GE
Kont.

8. IPC 6027 Digitalt input modul.

Dette afsnit beskriver den hardwaremæssige opbygning af IPC-6027. Kortets adressering omtales, og snitfladen til periferien er tabelleret.

8.1 Funktionel beskrivelse.

IPC 6027 modulet giver mulighed for tilslutning af 30 digitale indgange. En indgang aktiveres ved en simpel jordslutning og alle indgange er forsynet med optokoblere. En skematisk illustration af modulet er givet i nedenstående figur.



IPC 6027 INPUT MODUL

Figuren illustrerer også det elektriske indgangsækvivalent. De

digitale indgange er således ikke indbyrdes galvanisk adskilte, idet den ene ende af indgangsdioden altid er ført til fællesleder en (Signal GND). Når flere kort er monteret, vil fællesleder en være forbundet til alle kort i samme kortmagasin.

De elektriske data for indgangen er følgende:

Indgansspænding åben indgang	:	-24 V
Indgangsimpedans	:	22 K ohm
Maksimal impedans mod jord ved aktiv indgang	:	300 ohm
Minimal impedans mod jord ved passiv indgang	:	50 K ohm

8.2 Adressering.

Kortet anvender 4 i/o adresser på I/O type 0 . Basis adressen sættes på switch registeret, hvor mest betydende bit er anbragt nærmest eurokonnektoren.

Ved læsning af de fire adresser fås følgende information:

Offset fra basisadr.	Funktion	
0	bit 7 (MSB)	: test af topconnector: 0 hvis topkonnektor monteret
	bit 6	: test af trykknap: 1 hvis knap indtrykket
	bit 5-bit 0	: input kanal 1-6 med kanal 1 i databit 5.

1	bit 7-bit 0	: input kanal 7-14 med kanal 7 i databit 7.
2	bit 7-bit 0	: input kanal 15-22 med kanal 15 i databit 7
3	bit 7 - bit 0	: input kanal 23-30 med kanal 23 i databit 7

Informationen fra input kanalerne er 0, hvis indgangen er sluttet til jord og logisk 1 hvis indgangen er åben.

Basis adresse 0 kan skrives. Ved skrivning tændes eller slukkes indikationsdioden i overensstemmelse med databit 0. (databit 0:= 1 vil tænde dioden). Dioden tændes under restart (power up).

Databit 6 og 7 afspejler følgende fysiske forhold.

00 : Topkonnektor monteret og knap ej aktiveret

01 : Topkonnektor monteret og knap aktiveret

11 : Intet kort monteret på adressen eller kort uden topkonnektor og med aktiveret knap monteret.

10 : Topkonnektor ej monteret og knap ej aktiveret

Hvis topkonnektor skal detekteres må forbindelseslusen laves i selve konnektoren.

8.3 Topkonnektor.

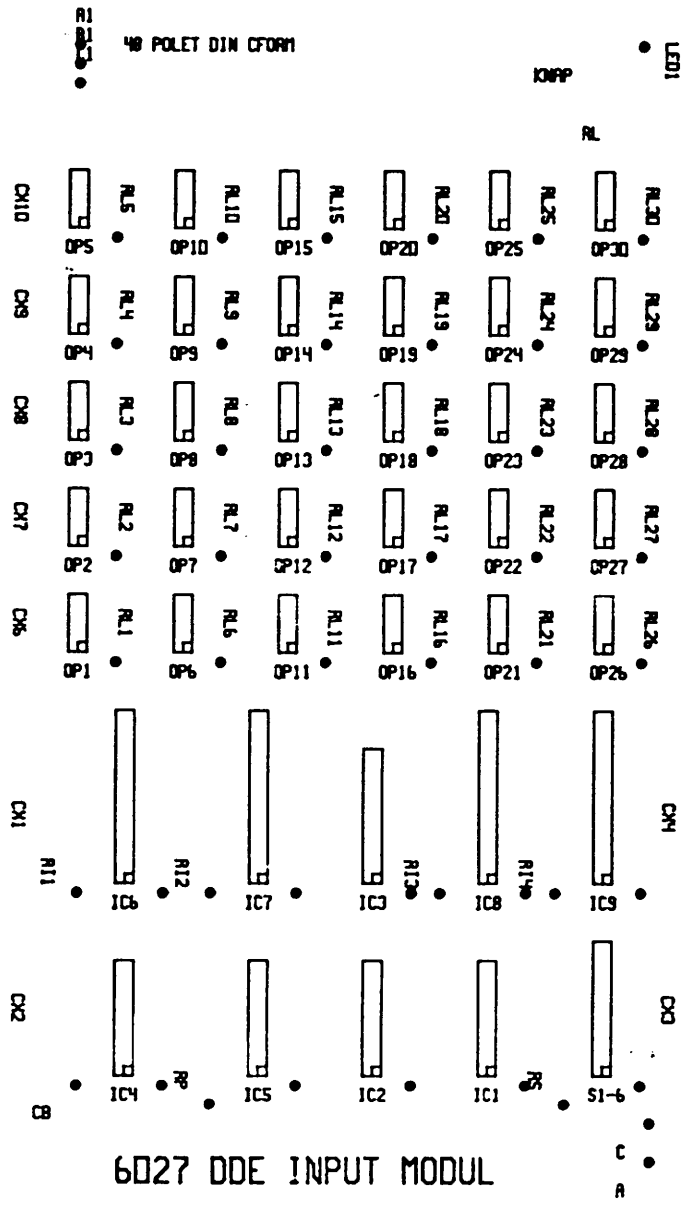
Konnektortype : 48 polet DIN 41612 konnektor C/2 (hanstik monteret i print).

pin	a	b	c
1	Digital GND	Toptest	+5V
2	Signal GND	Input 1	Input 2
3	-"-	Input 3	Input 4
4	-"-	Input 5	Input 6
5	-"-	Input 7	Input 8
6	-"-	Input 9	Input 10
7	-"-	Input 11	Input 12
8	-"-	Input 13	Input 14
9	-"-	Input 15	Input 16
10	-"-	Input 17	Input 18
11	-"-	Input 19	Input 20
12	-"-	Input 21	Input 22
13	-"-	Input 23	Input 24
14	-"-	Input 25	Input 26
15	-"-	Input 27	Input 28
16	-24 V	Input 29	Input 30

Signal Toptest skal forbindes til Digital GND i topkonnektor af brugeren for at muliggøre detektion af stik monteret.

Input kanaler aktiveres ved jordslutning mod Signal GND. -24 V og Signal GND er galvanisk adskilt fra +5V og Digital GND. +5 V og -24 V benyttes kun af DDE´s testudstyr og må ellers ikke benyttes.

8.4 Komponentplacering IPC 6027.



8.5 Komponentliste IPC 6027.

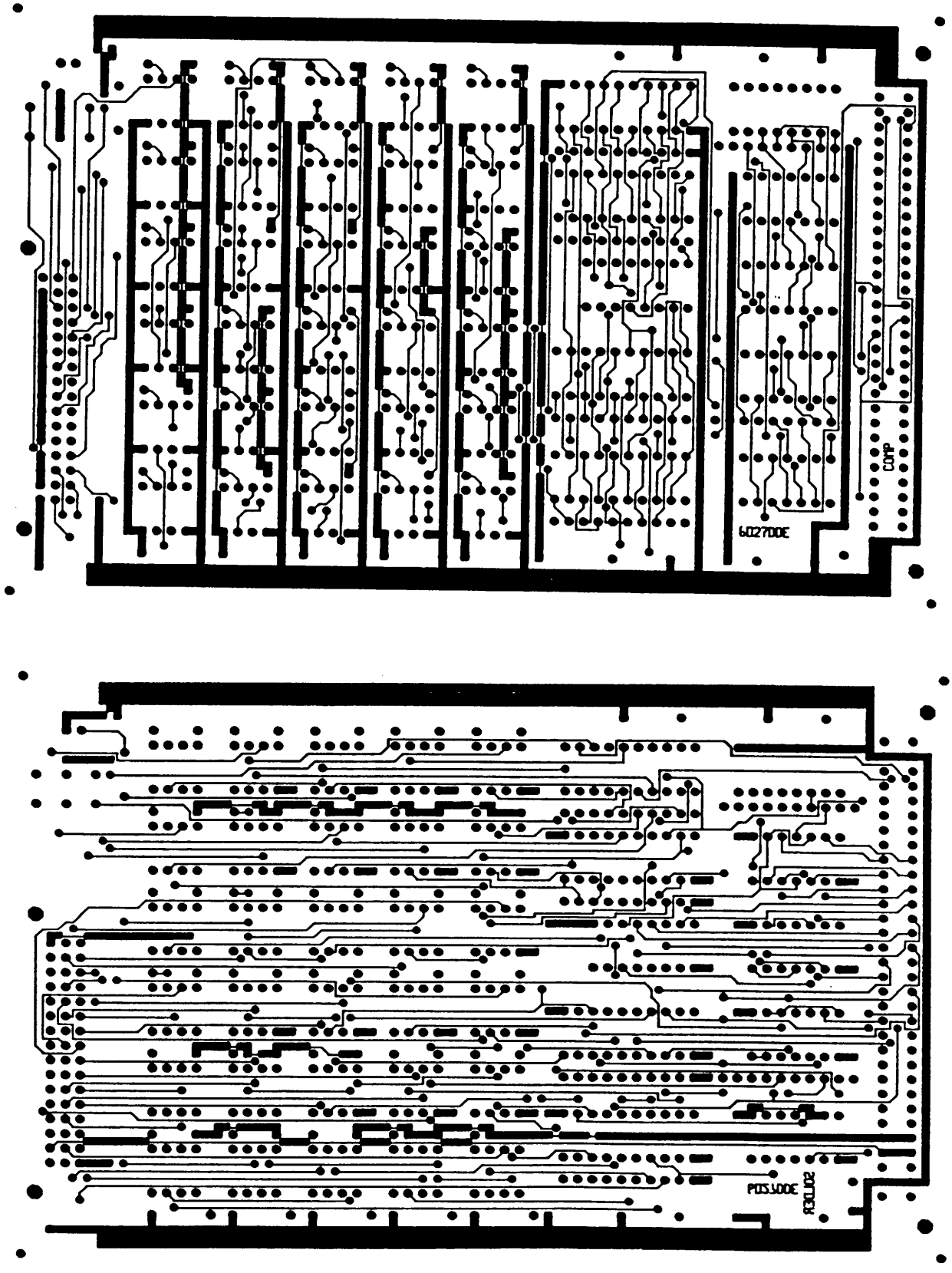
navn	Komponent
IC1	SN74LS136
IC2	SN74LS136
IC3	SN74LS138
IC4	SN74LS74A
IC5	SN7433
IC6	SN74LS244
IC7	SN74LS244
IC8	SN74LS244
IC9	SN74LS244
OP1- OP30	Sokler for optokoblere. 8 pin standard. 6 pin standard opnås ved at benytte de nedre 6 ben i soklen.(1 og 8 anvendes ikke).
RL	Faldmodstand for lysdiode. Nominelt 390 OHM.
RL1- RL30	Seriemodstande for indgangsdioder. Nominelt 22K OHM .
RI1- RI4	Pull-up modstande for kollektorsiden af optokoblerne. Der anvendes SIL--resistornetværk med 8 modstande i hver pakke. Nominel modstandsværdi er 22K OHM
RP	Pull-up netværk i SIL. Nominelt 1 K OHM.
C2	0.1 uF .

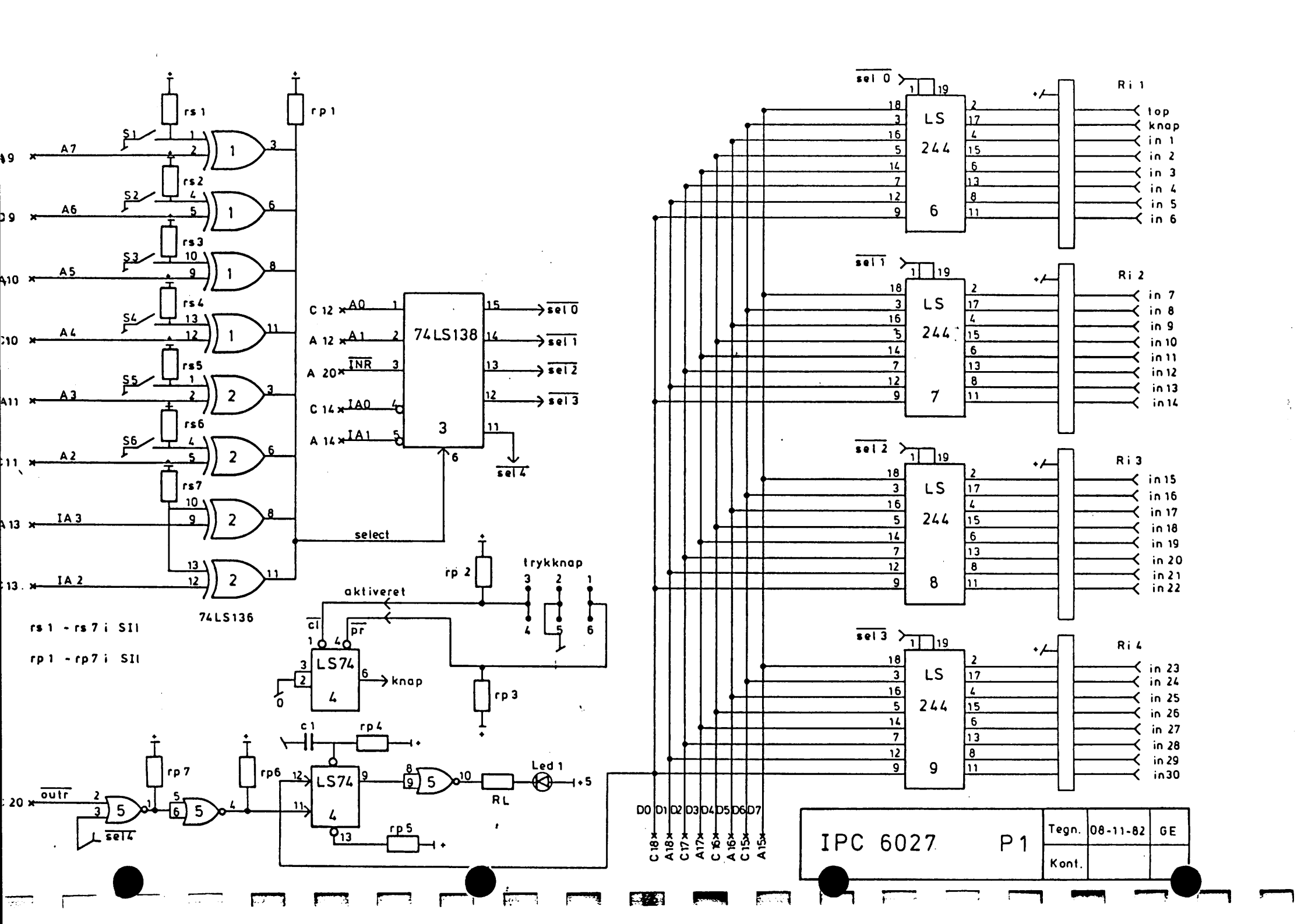
CX1-
CX10 0.1uF Afkoblingskondensator.

S1- DIL switch, 6 kontakter
S6

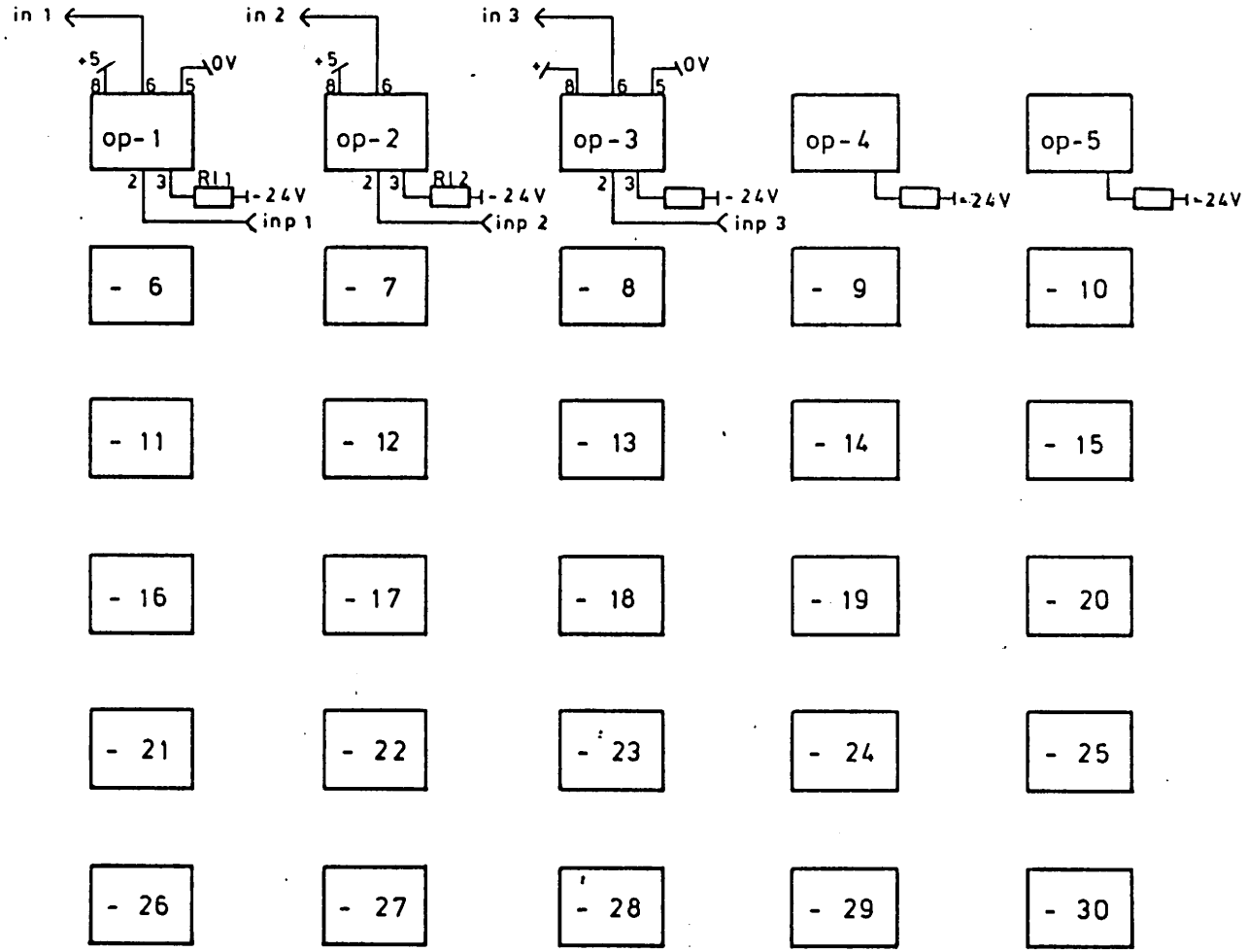
Topkonnektor: 48 polet DIN 41612 konnektor C/2,
hanstik.

8.6 Print layout IPC 6027.



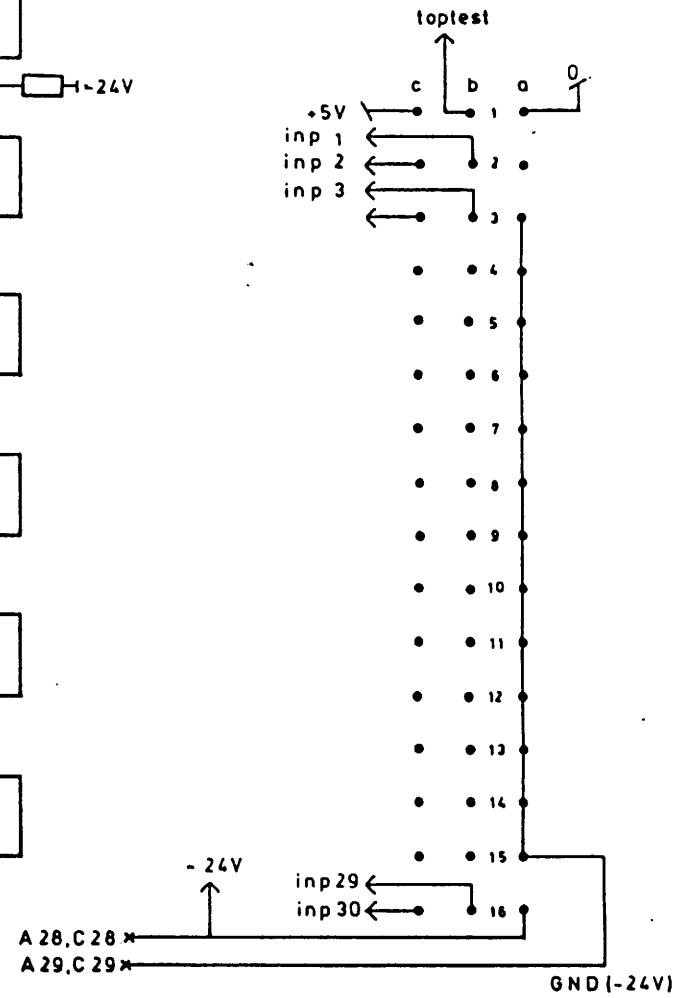

rs 1
rp 1
S1
A7
rs 2
S2
A6
rs 3
S3
A5
rs 4
S4
A4
rs 5
S5
A3
rs 6
S6
A2
rs 7
IA 3
IA 2
74LS136
rs 1 - rs 7 i SII
rp 1 - rp 7 i SII
C 12
A 12
A 20
C 14
A 14
A0
A1
INR
IA0
IA1
74LS138
3
sel 0
sel 1
sel 2
sel 3
sel 4
select
rp 2
trykknap
aktiveret
cl
pr
LS74
4
knap
rp 3
c 1
rp 4
rp 7
rp 6
outr
sel4
Led 1
RL
rp 5
D0 D1 D2 D3 D4 D5 D6 D7
C18 A18 C17 A17 C16 A16 C15 A15
LS 244
6
7
8
9
Ri 1
Ri 2
Ri 3
Ri 4
top
knap
in 1
in 2
in 3
in 4
in 5
in 6
in 7
in 8
in 9
in 10
in 11
in 12
in 13
in 14
in 15
in 16
in 17
in 18
in 19
in 20
in 21
in 22
in 23
in 24
in 25
in 26
in 27
in 28
in 29
in30
IPC 6027 P1
Tegn. 08-11-82 GE
Kont.

30 Optokoblere

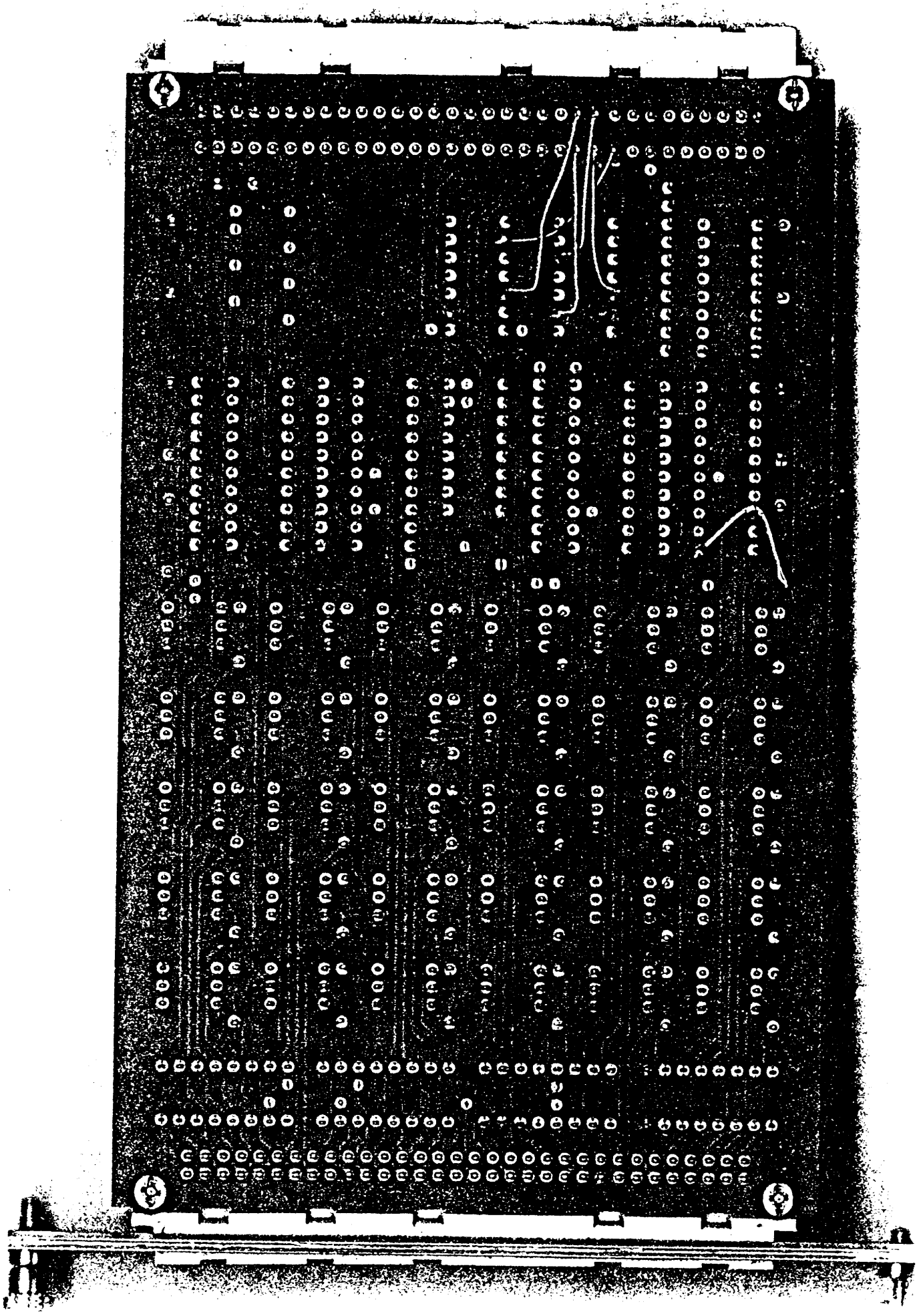


Forbindelser vist for op-1 til op-3
Alle øvrige har samme forbindelser.

Topkonnektor



IPC 6027 P2	Tegn.	08-11-82	GE
	Kont.		



MANUAL

for

IPC/1 Isoleret DI modul 6027s

Dansk Data Elektronik A/S

Juni 1985.

Forfatter: Allan Petersen

Juni 1985

Indholdsfortegnelse:

Introduktion.

IPC/1 6027s modulet har 30 indbyrdes galvanisk adskilte optokobler indgange. Indgangssiden er isoleret fra processorstel; isolationsspændingen er 1500 V DC.

Kortet er ikke forsynet med indgangsfiltrering foran optokoblerne, men indgangene er forsynet med transient- og polaritets-beskyttelse.

De elektriske data for en indgang er følgende:

Aktiveringsspænding:	Nominelt 48 V DC,	min. 32 V DC.
Indgangsimpedans :	Nominelt 22 k ohm	
Spænding v. passiv indgang:	Nominelt 0 V,	max. 3 V DC.

Ønskes andre indgangsniveauer, må formodstandene ændres, idet optokoblernes tilstand bestemmes af indgangsstrømmen.

Tilslutning til periferien foretages via Europakonnektor DIN 41612, byggeform B, 64 polet hanstik.

Funktionel beskrivelse.

Kortet er opbygget med 30 stk. optokoblere med formodstande og polaritetsbeskyttelses-dioder. Optokoblernes tilstande kan læses af CPU'en via fire driverkredse; totalt læses 32 bit, heraf anvendes 30 til optokoblersignalerne. De to sidste anvendes til kontrollæsning af, hvorvidt 6027s kortet er forbundet til bussen, idet disse to bits altid læses som data low.

Driverindgangene til disse to bits kan strappes (jumper JP) til enten GND eller +5 V. Normalt forbindes til GND, men hvis der benyttes inverterende driverkredse for at få aktiv low indgange, strappes de to bit til +5 V.

Aktiveringsspændingen for optokoblerindgangene kan ændres ved tilpasning af formodstandene, idet aktiverings strømmen skal bibeholdes.

Kortet anvender den sædvanlige IPC adresseringsmetode med IO-adresse og type-adresse; se desuden side 5

Kortet optager 4 I/O adresser; basisadressen sættes på kortet på et switch register. Den til kortet hørende type-adresse (TYPE = 2) er fast kodet i printet.

Adressering:

I/O ADRESSER:

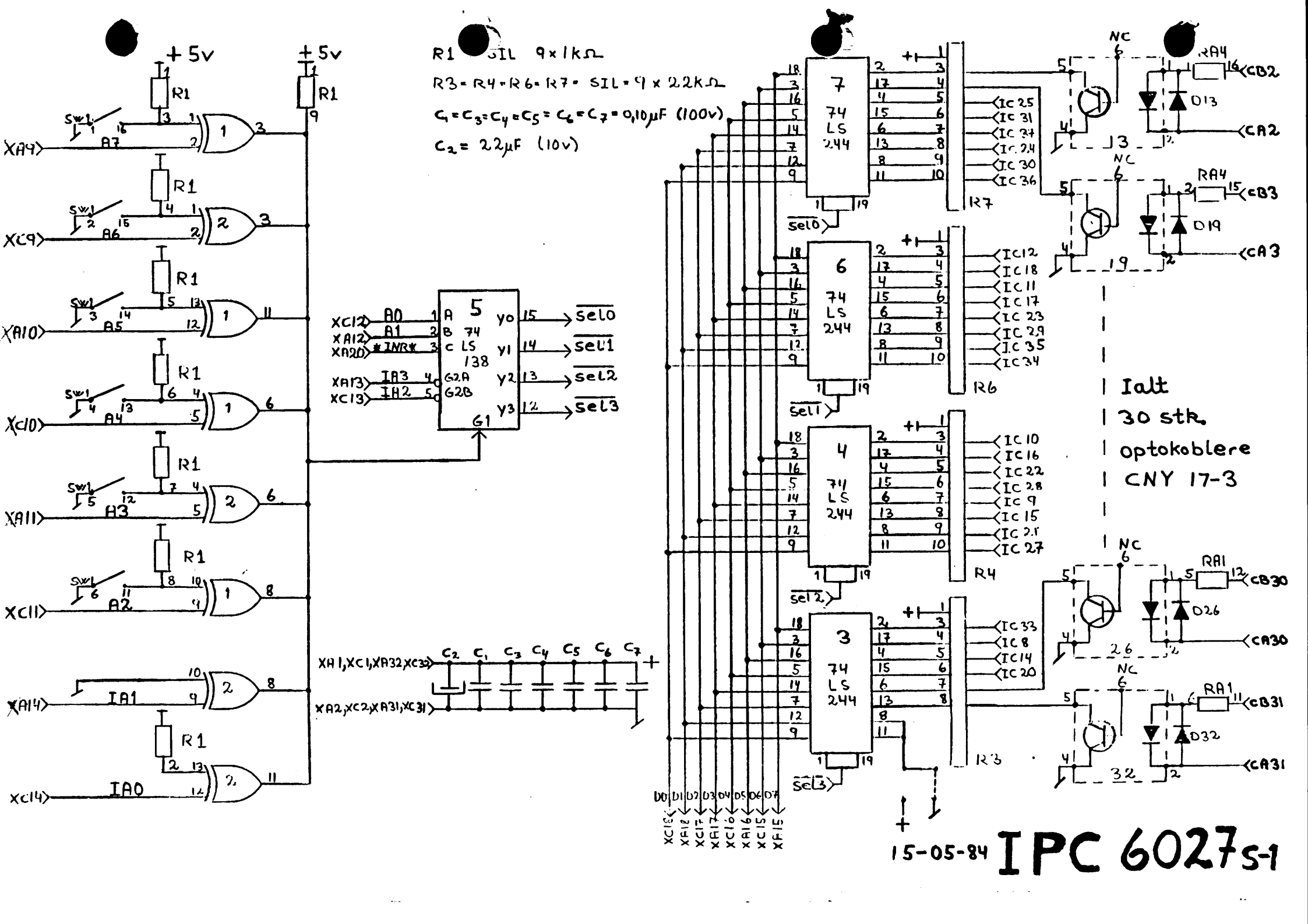
Switch på kortet stilles til (4n):

		Bit7							Bit0
IN (4n+3):		D7	D6	D5	D4	D3	D2	D1	D0
	Kanal:	Ch25	Ch26	Ch27	Ch28	Ch29	Ch30	Low	Low
*)	ab pin:	26	27	28	29	30	31		
IN (4n+2):		D7	D6	D5	D4	D3	D2	D1	D0
	Kanal:	Ch17	Ch18	Ch19	Ch20	Ch21	Ch22	Ch23	Ch24
*)	ab pin:	18	19	20	21	22	23	24	25
IN (4n+1):		D7	D6	D5	D4	D3	D2	D1	D0
	Kanal:	Ch9	Ch10	Ch11	Ch12	Ch13	Ch14	Ch15	Ch16
*)	ab pin:	10	11	12	13	14	15	16	17
IN (4n):		D7	D6	D5	D4	D3	D2	D1	D0
	Kanal:	Ch1	Ch2	Ch3	Ch4	Ch5	Ch6	Ch7	Ch8
*)	ab pin:	2	3	4	5	6	7	8	9

*): ab pin nummer refererer til input konnektor pin numre:

Den pågældende bit er 0, når der påtrykkes en spænding på nominelt 48 V mellem det tilhørende pin-nummers a og b side (b og a siderne er henholdsvis positiv og negativ spænding).

TYPE = 2.


+5v
+5v
R1 SIL 9×1kΩ
R3=R4=R6=R7= SIL=9×22kΩ
C1=C3=C4=C5=C6=C7=0,10µF (100v)
C2= 22µF (10v)
XA4
XC9
XA10
XC10
XA11
XC11
XA14
XC14
IA1
IA0
SW1
A7
A6
A5
A4
A3
A2
XC12
XA12
XA20
XA13
XC13
A0
A1
INH
IA3
IA2
sel0
sel1
sel2
sel3
XA1,XC1,XA32,XC32
XA2,XC2,XA31,XC31
C2 C1 C3 C4 C5 C6 C7
IC25
IC31
IC37
IC24
IC30
IC36
IC12
IC18
IC11
IC17
IC23
IC29
IC35
IC34
IC10
IC16
IC22
IC28
IC9
IC15
IC21
IC27
IC33
IC8
IC14
IC20
R7
R6
R4
R3
NC
RA4
RA1
CB2
CA2
CB3
CA3
CB30
CA30
CB31
CA31
D13
D19
D26
D32
Ialt
30 stk.
optokoblere
CNY 17-3
D0 D1 D2 D3 D4 D5 D6 D7
XC13
XA12
XC17
XA17
XC16
XA16
XC15
XA15
15-05-84
IPC 6027 S-1

Komponentliste:

Komponentliste IPC 6027s

Navn	Komponent	pins	Fabrikat
IC1	74LS136N	14	Texas
IC2	74LS136N	14	Texas
IC3	74LS244N	20	Texas
IC4	74LS244N	20	Texas
IC5	74LS138N	16	Texas
IC6	74LS244N	20	Texas
IC7	74LS244N	20	Texas
IC8	CNY 17-3	6	Siemens
IC9	CNY 17-3	6	Siemens
IC10	CNY 17-3	6	Siemens
IC11	CNY 17-3	6	Siemens
IC12	CNY 17-3	6	Siemens
IC13	CNY 17-3	6	Siemens
IC14	CNY 17-3	6	Siemens
IC15	CNY 17-3	6	Siemens
IC16	CNY 17-3	6	Siemens
IC17	CNY 17-3	6	Siemens
IC18	CNY 17-3	6	Siemens
IC19	CNY 17-3	6	Siemens
IC20	CNY 17-3	6	Siemens
IC21	CNY 17-3	6	Siemens
IC22	CNY 17-3	6	Siemens
IC23	CNY 17-3	6	Siemens
IC24	CNY 17-3	6	Siemens
IC25	CNY 17-3	6	Siemens
IC26	CNY 17-3	6	Siemens
IC27	CNY 17-3	6	Siemens
IC28	CNY 17-3	6	Siemens
IC29	CNY 17-3	6	Siemens
IC30	CNY 17-3	6	Siemens
IC31	CNY 17-3	6	Siemens
IC32	CNY 17-3	6	Siemens
IC33	CNY 17-3	6	Siemens

IC34	CNY 17-3	6	Siemens
IC35	CNY 17-3	6	Siemens
IC36	CNY 17-3	6	Siemens
IC37	CNY 17-3	6	Siemens

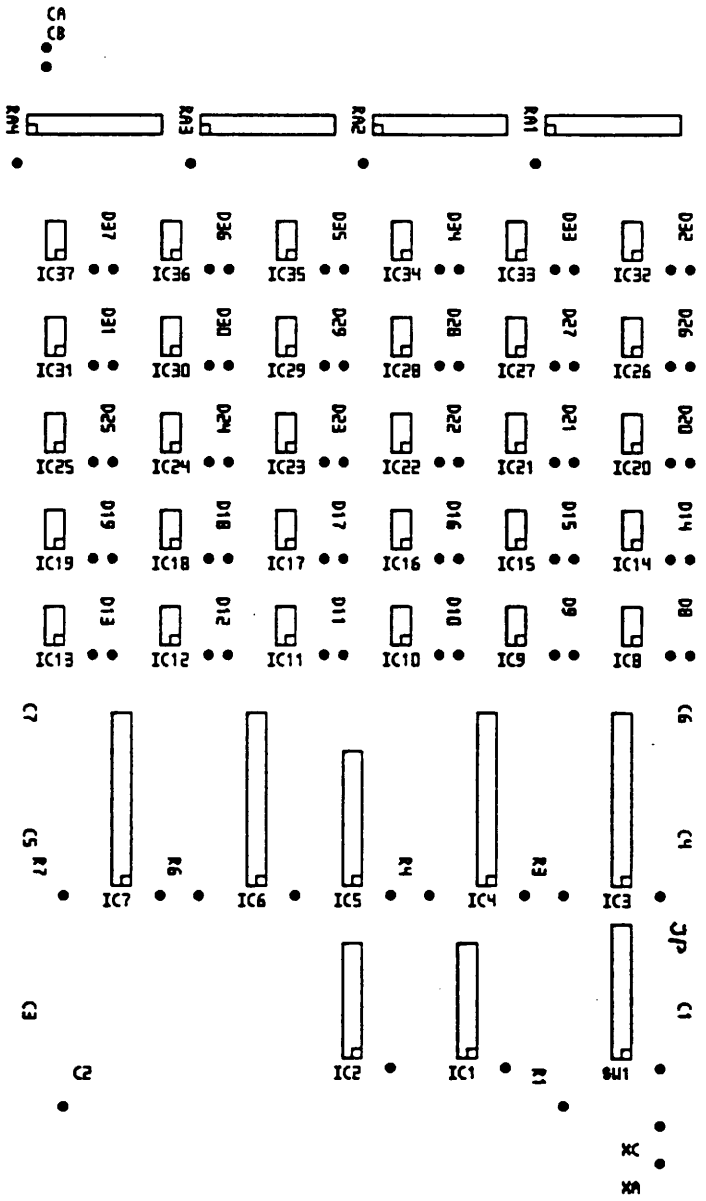
D8	1N4148	
D9	1N4148	
D10	1N4148	
D11	1N4148	
D12	1N4148	
D13	1N4148	
D14	1N4148	
D15	1N4148	ORIENTERING
D16	1N4148	AF
D17	1N4148	DIODER
D18	1N4148	AFMÆRKET
D19	1N4148	MED
D20	1N4148	GUL
D21	1N4148	PRIK
D22	1N4148	VED
D23	1N4148	KATODE.
D24	1N4148	
D25	1N4148	
D26	1N4148	
D27	1N4148	
D28	1N4148	
D29	1N4148	
D30	1N4148	
D31	1N4148	
D32	1N4148	
D33	1N4148	
D34	1N4148	
D35	1N4148	
D36	1N4148	
D37	1N4148	

C1	100 nF afkobling	Siemens
C2	22 uF, 10 V Sol.Al.	Philips

	(Philips kodenr. 2222 122 54229)	
C3	100 nF afkobling	Siemens
C4	100 nF afkobling	Siemens
C5	100 nF afkobling	Siemens
C6	100 nF afkobling	Siemens
C7	100 nF afkobling	Siemens
R1	Sil modst. 9x1k	
R3	Sil modst. 9x22k	
R4	Sil modst. 9x22k	
R6	Sil modst. 9x22k	
R7	Sil modst. 9x22k	
RA1	Dil modst. 8x22k	
RA2	Dil modst. 8x22k	
RA3	Dil modst. 8x22k	
RA4	Dil modst. 8x22k	
SW1	Dil switch, 6 switches (evt 8)	
XA/XC	Euro-connector, 64 pin (a og c)	
CA/CB	Euro-connector, 64 pin (a og b)	

Desuden monteres jumper JP v. SW1, se tekst.

Komponentplacering:



Forbindelser til stik:

Pin:	a	b
1	NC.	NC.
2	Ch. 1 (Neg)	Ch. 1 (Pos)
3	Ch. 2 (Neg)	Ch. 2 (Pos)
4	Ch. 3 (Neg)	Ch. 3 (Pos)
5	Ch. 4 (Neg)	Ch. 4 (Pos)
6	Ch. 5 (Neg)	Ch. 5 (Pos)
7	Ch. 6 (Neg)	Ch. 6 (Pos)
8	Ch. 7 (Neg)	Ch. 7 (Pos)
9	Ch. 8 (Neg)	Ch. 8 (Pos)
10	Ch. 9 (Neg)	Ch. 9 (Pos)
11	Ch.10 (Neg)	Ch.10 (Pos)
12	Ch.11 (Neg)	Ch.11 (Pos)
13	Ch.12 (Neg)	Ch.12 (Pos)
14	Ch.13 (Neg)	Ch.13 (Pos)
15	Ch.14 (Neg)	Ch.14 (Pos)
16	Ch.15 (Neg)	Ch.15 (Pos)
17	Ch.16 (Neg)	Ch.16 (Pos)
18	Ch.17 (Neg)	Ch.17 (Pos)
19	Ch.18 (Neg)	Ch.18 (Pos)
20	Ch.19 (Neg)	Ch.19 (Pos)
21	Ch.20 (Neg)	Ch.20 (Pos)
22	Ch.21 (Neg)	Ch.21 (Pos)
23	Ch.22 (Neg)	Ch.22 (Pos)
24	Ch.23 (Neg)	Ch.23 (Pos)
25	Ch.24 (Neg)	Ch.24 (Pos)
26	Ch.25 (Neg)	Ch.25 (Pos)
27	Ch.26 (Neg)	Ch.26 (Pos)
28	Ch.27 (Neg)	Ch.27 (Pos)
29	Ch.28 (Neg)	Ch.28 (Pos)
30	Ch.29 (Neg)	Ch.29 (Pos)
31	Ch.30 (Neg)	Ch.30 (Pos)
32	NC.	NC.

Forbindelser til bus:

Pin:	a	c
1	+ 5 V	+ 5 V
2	GND	GND
3		
4		
5		
6		
7		
8		
9	A7	A6
10	A5	A4
11	A3	A2
12	A1	A0
13	IA3	IA2
14	IA1	IA0
15	D7	D6
16	D5	D4
17	D3	D2
18	D1	D0
19		
20	*INR*	
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31	GND	GND
32	+ 5 V	+ 5 V

Testbeskrivelse:

Til test af Optokoblerkortet findes:

- En testboks, der kan indskydes mellem input konnektoren og periferikablet, hvorved boksen dels viser tilstanden af periferi-indgangene, dels tilstanden af et påtrykt ønsket manøvre-signal.

- Et testprogram, der kontinuerligt aflæser de enkelte indgange og præsenterer tilstandene på en skærmterminal.

Disposition af optokoblerne i forhold til testdisplay, idet numrene refererer til IC betegnelserne på kortet:

33 8 14 20 26 32 XX XX

10 16 22 28 9 15 21 27

12 18 11 17 23 29 35 34

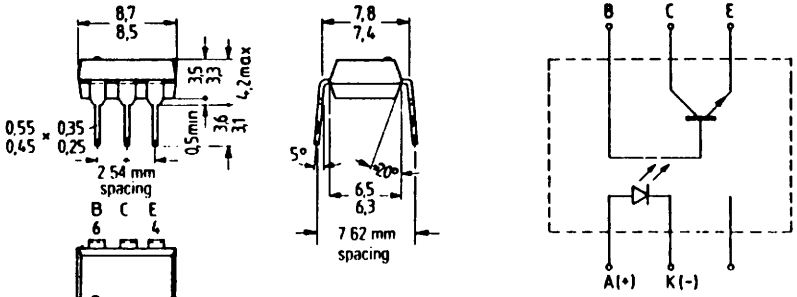
13 19 25 31 37 24 30 36

The optically coupled isolator CNY 17 uses as emitter a GaAs infrared emitting diode which is optically coupled with a silicon planar phototransistor acting as detector. The component is incorporated in a plastic plug-in package 20 A 6 DIN 41866.

The coupling device is suitable for signal transmission between two electrically separated circuits. The potential difference between the circuits to be coupled is not allowed to exceed the maximum permissible isolation voltage.

The VDE test symbol will be applied for.

Type	Ordering code
CNY 17-1	Q62703-N1-S1
CNY 17-2	Q62703-N1-S2
CNY 17-3	Q62703-N1-S3
CNY 17-4	Q62703-N1-S4



Approx. weight 0.7 g
Dimensions in mm

IR emitter (emitter)	1 anode 2 cathode 3 not connected
Phototransistor (detector)	4 emitter 5 collector 6 base

[1]) TRIOS®=Transparent ion screen

Maximum ratings

Emitter (GaAs infrared emitter)

Reverse voltage	V_R	6	V
DC forward current	I_F	60	mA
Surge forward current ($t \leqq 10$ µs)	I_{FSM}	1.5	A
Total power dissipation	P_{tot}	100	mW

Detector (silicon phototransistor)

Collector-emitter voltage ($I_B = 0$)	V_{CEO}	70	V
Emitter-base voltage ($I_C = 0$)	V_{EBO}	7	V
Collector current	I_C	50	mA
Collector current ($t \leqq 1$ ms)	I_{CSM}	100	mA
Total power dissipation	P_{tot}	150	mW

Optocoupler

Storage temperature range	T_{stg}	−40 to +150	°C
Ambient temperature range	T_{amb}	−40 to +100	°C
Junction temperature	T_j	100	°C
Soldering temperature (max. 10 sec) [1])	T_{sold}	260	°C
Isolation voltage (1 min) [2]) between emitter and detector referred to standard climate 23/50 DIN 50014	V_{is}	4400	Vdc
AC reference voltage } in acc. with DIN 57883, 6.80 DC reference voltage } and/or VDE 0883, 6.80			
Leakage path		min 8.2	mm
Air path		min 7.6	mm

[1]) Dip soldering: Insertion depth ≦3.6 mm

[2]) DC test voltage in accordance with DIN 57883, draft 4/78

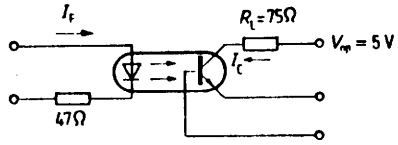
Leakage current strength			
In acc. with VDE 0110 § 6, table 3, and DIN 53480/VDE 0303, part 1.	KB	≧600 (group 3)	
Isolation resistance at $V_{is}=500$ V	R_{is}	10^{11}	Ω
Climatic conditions			
Application in acc. with DIN 40040, humidity category F			
Flammability			
In acc. with DIN 57471 or VDE 0471, part 2 (April '75) and/or MIL 202 E, method 111 A			
Characteristics ($T_{amb}=25$ °C)			
Emitter (GaAs infrared emitter)			
Forward voltage ($I_F=60$ mA)	V_F	1.25 (≦1.65)	V
Breakdown voltage ($I_R=100$ µA)	$V_{(BR)}$	30 (≧6)	V
Reverse current ($V_R=6$ V)	I_R	0.01 (≦10)	µA
Capacitance ($V_R=0$ V; $f=1$ MHz)	C_o	40	pF
Thermal resistance[1])	R_{thJA}	750	K/W
Detector (silicon phototransistor)			
Capacitance ($V_{CE}=5$ V; $f=1$ MHz)	C_{CE}	6.8	pF
($V_{CB}=5$ V; $f=1$ MHz)	C_{CB}	8.5	pF
($V_{EB}=5$ V; $f=1$ MHz)	C_{EB}	11	pF
Thermal resistance[1])	R_{thJA}	500	K/W
Optocoupler			
Collector-emitter saturation voltage ($I_F=10$ mA; $I_C=2.5$ mA)	V_{CEsat}	0.25 (≦0.4)	V
Coupling capacitance	C_K	0.55	pF

The optocouplers are grouped according to their current transfer ratio I_C/I_F at $I_F=10$ mA and $V_{CE}=5$ V, and marked by Roman numerals.

Group		1	2	3	4	
I_C/I_F		40 to 80	63 to 125	100 to 200	160 to 320	%
Collector-emitter reverse current ($V_{CE}=10$ V)	I_{CEO}	2 (≦50)	2 (≦50)	5 (≦100)	5 (≦100)	nA

[1]) Static air, coupler soldered to PCB or base.

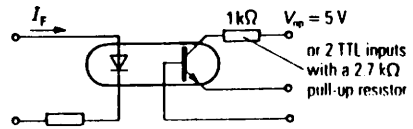
Switching times (For definitions refer to page 68)
Linear operation (without saturation)

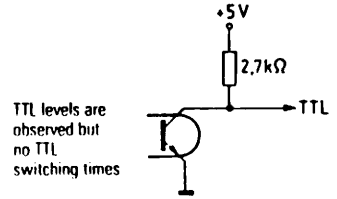


Load resistance	R_L	75	Ω
Turn-on time	t_{on}	3.0 (≦5.6)	µs
Rise time	t_r	2.0 (≦4.0)	µs
Turn-off time	t_{off}	2.3 (≦4.1)	µs
Fall time	t_f	2.0 (≦3.5)	µs
Cut-off frequency	f_{co}	250	kHz

I_F = 10 mA
V_{op} = 5 V
T_{amb} = 25 °C

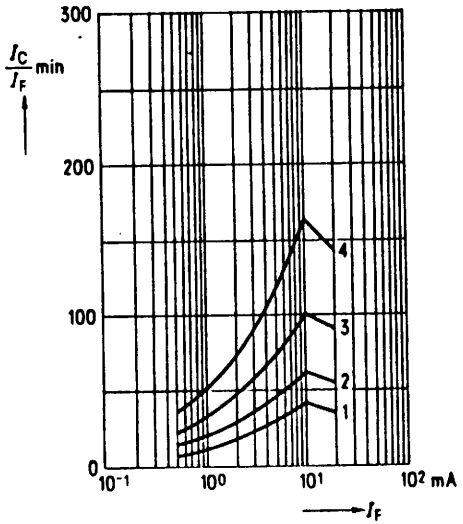
Switching operation (with saturation)



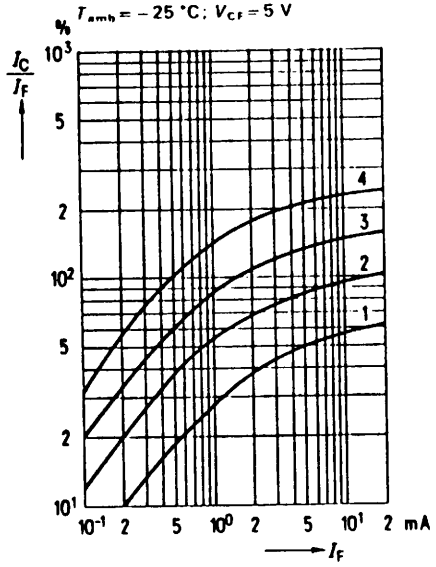


Group		1 $I_F=20$ mA	2 and 3 $I_F=10$ mA	4 $I_F=5$ mA	
Turn-on time	t_{on}	3.0 (≦5.5)	4.2 (≦8.0)	6.0 (≦10.5)	µs
Rise time	t_r	2.0 (≦4.0)	3.0 (≦6.0)	4.6 (≦8.0)	µs
Turn-off time	t_{off}	18 (≦34)	23 (≦39)	25 (≦43)	µs
Fall time	t_f	11 (≦20)	14 (≦24)	15 (≦26)	µs
	V_{CEsat}	0.25 (≦0.4)			V

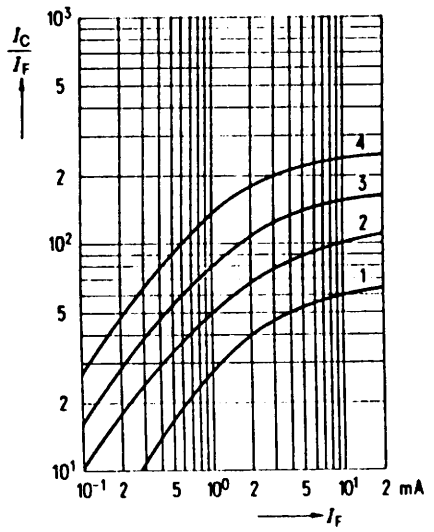
Minimum current transfer ratio versus diode forward current
$T_{amb} = 25\ °C$; $V_{CE} = 5\ V$



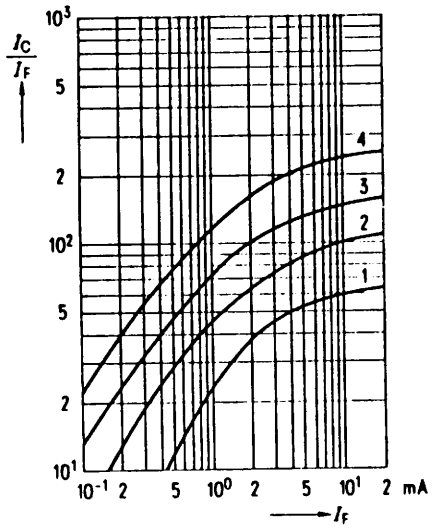
Current transfer ratio (typ.) versus diode forward current
$T_{amb} = -25\ °C$; $V_{CE} = 5\ V$



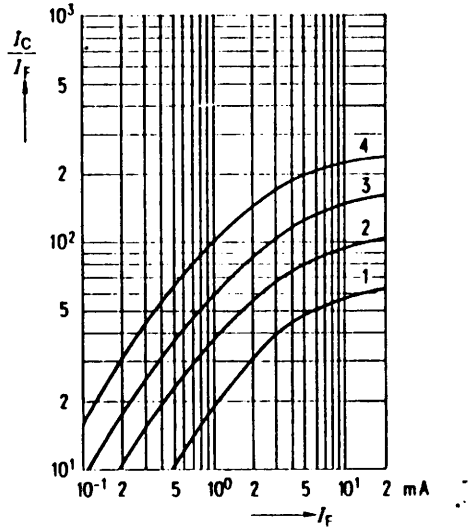
Current transfer ratio (typ.) versus diode forward current
$T_{amb} = 0\ °C$; $V_{CE} = 5\ V$



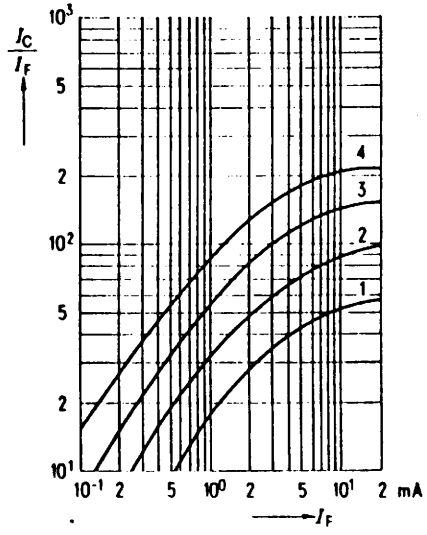
Current transfer ratio (typ.) versus diode forward current
$T_{amb} = 25\ °C$; $V_{CE} = 5\ V$



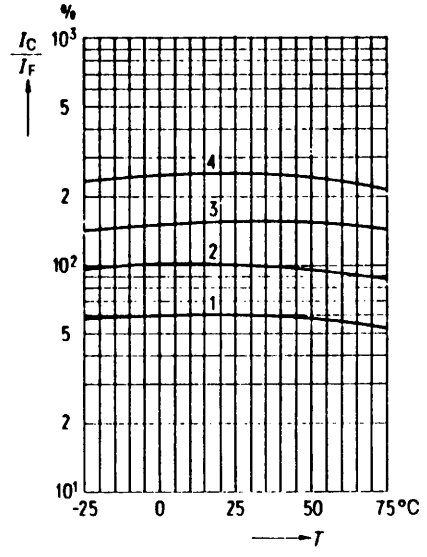
Current transfer ratio (typ.) versus diode forward current
$T_{amb} = 50\ °C$; $V_{CE} = 5\ V$



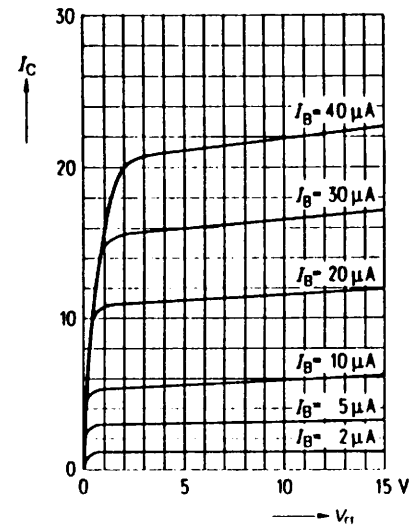
Current transfer ratio (typ.) versus diode forward current
$T_{amb} = 75\ °C$; $V_{CE} = 5\ V$



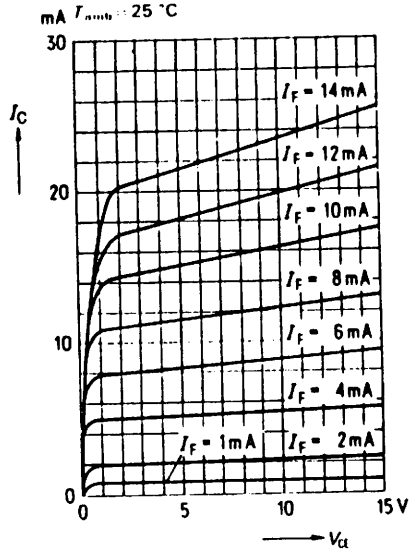
Current transfer ratio (typ.) versus temperature
$I_F = 10\ mA$; $V_{CE} = 5\ V$



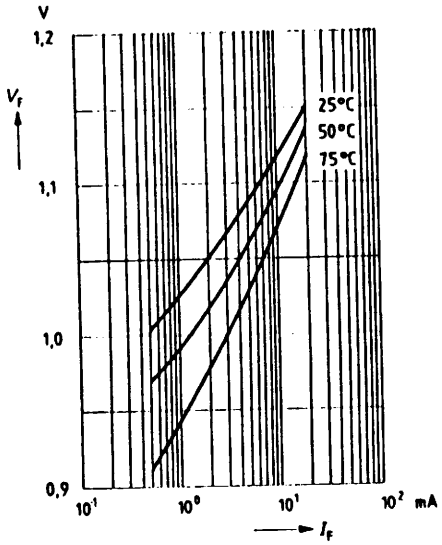
Collector current versus collector-emitter voltage
(current gain $B = 550$)
$T_{amb} = 25\ °C$; $I_F = 0$



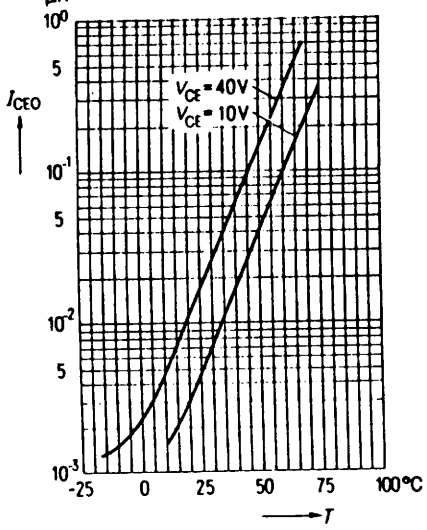
Output characteristics (typ.)
Collector current versus collector-emitter voltage
Base not connected
T_{amb} = 25 °C



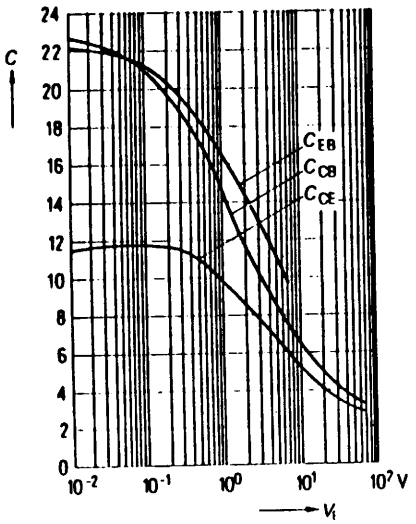
Forward voltage (typ.) of the diode versus forward current



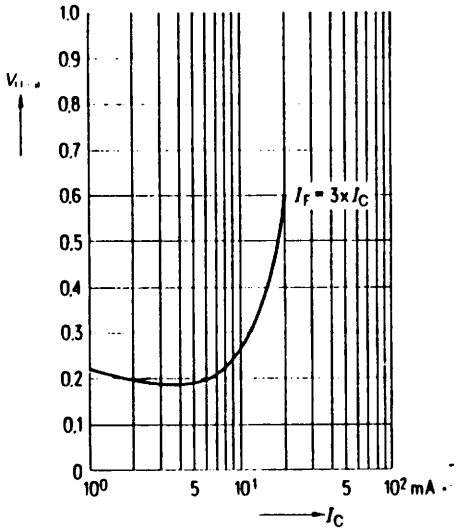
Collector-emitter reverse current (typ.) versus temperature
T_{amb} = 25 °C; I_F = 0



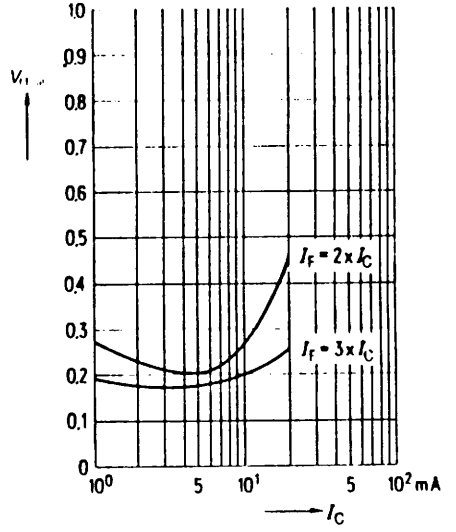
Capacitance (typ.) versus emitter voltage
T_{amb} = 25 °C; f = 1 MHz



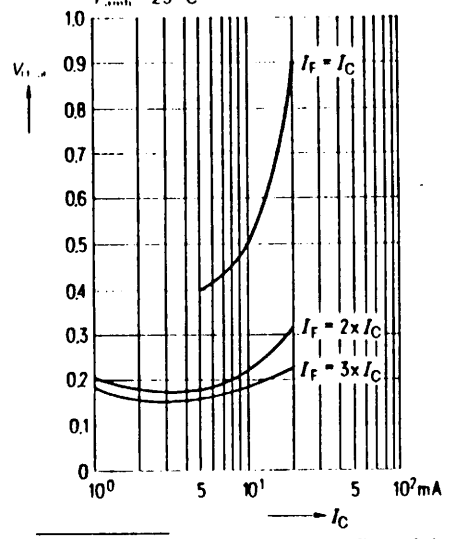
Collector-emitter saturation voltage (typ.) versus collector current and control range [1]) for group 1
V T_{amb} 25 °C



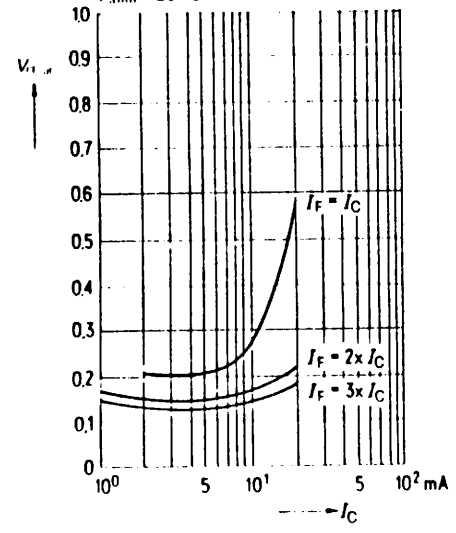
Collector-emitter saturation voltage (typ.) versus collector current and control range [1]) for group 2
V T_{amb} 25 °C



Collector-emitter saturation voltage (typ.) versus collector current and control range [1]) for group 3
V T_{amb} 25 °C

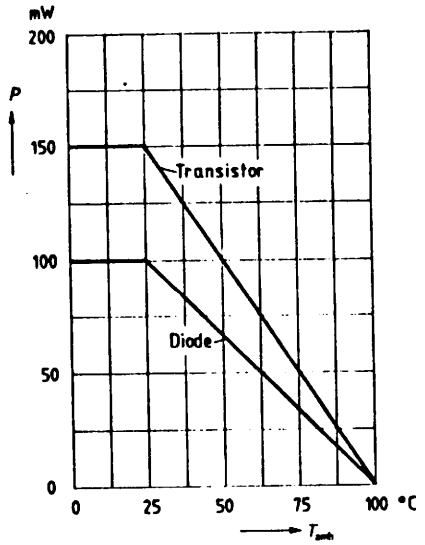


Collector-emitter saturation voltage (typ.) versus collector current and control range [1]) for group 4
V T_{amb} 25 °C

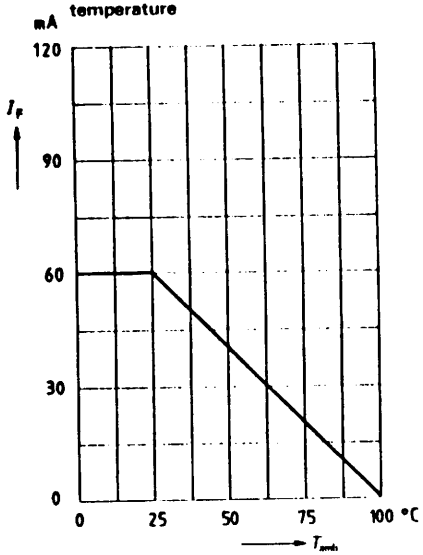


[1]) I_F = 2 x I_C means that the current flow of the diode has to be adjusted to the doubled value of the collector current

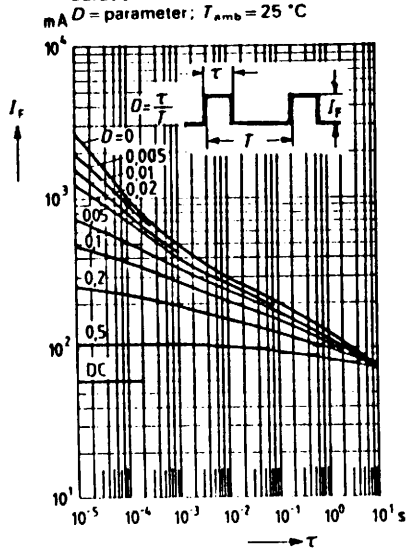
Permissible power dissipation versus ambient temperature



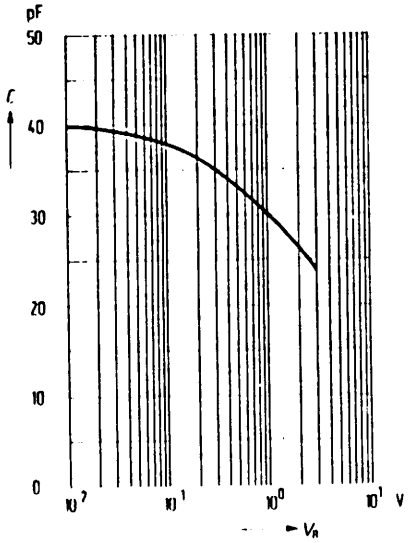
Permissible forward current of the diode versus ambient temperature



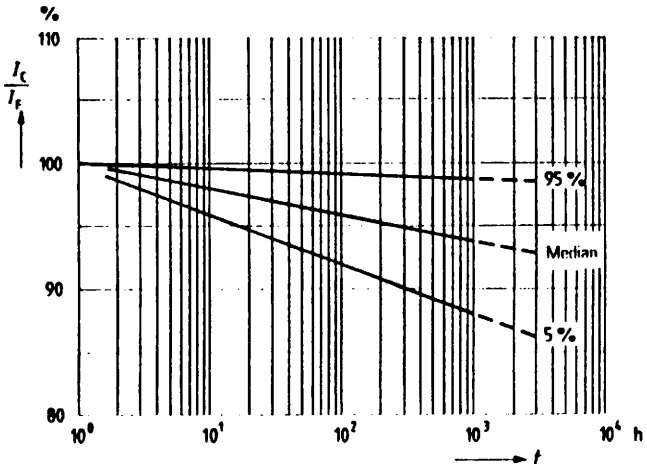
Permissible pulse handling capability
Forward current versus cycle duration
D = parameter; T_{amb} = 25 °C



Diode capacitance (typ.) versus reverse voltage
T_{amb} = 25 °C; f = 1 MHz



Current transfer ratio versus load time



V_{CE} = 5 V
R_L = 1 kΩ
T_{amb} = 25 °C
I_F = 60 mA = Measuring current
Confidence coefficient
S = 60%

Manual for

IPC/1 Digital Input Modul

Varenummer 6721

Dansk Data Elektronik A/S
Januar 1989

Ansvarlig: Gilbert E. Jensen

Indholdsfortegnelse

1. Introduktion

IPC/1 modulet type 6721 er et digitalt input kort med 30 optokobler indgange.

Modulets processorside er isoleret fra signalsiden, ligesom de enkelte kanaler er indbyrdes isolerede.

Kortet er ikke forsynet med indgangsfiltrering foran optokoblerne, men indgangene er forsynet med transient- og polaritetsbeskyttelse.

Kortet er forsynet med en 8-polet adresse-switch, og det er muligt at have 64 Digitale Input kort, svarende til 1920 kanaler, i et enkelt IPC/1 system.

Forbindelsen ud mod brugeren sker med et specielt stik, i hvilket der er monteret lysdioder til indikation af, om de enkelte kanaler er aktive eller ej.

Varenummeret dækker over board (varenummer 6721b) samt periferistik (varenummer 6721c).

2. Specifikationer

Antal digitale indgange:	30
Aftastningsprincip:	Optokobler med formodstande og polaritetsbeskyttelses-dioder.
Isolation mellem kanaler:	Min. 400 V
Isolation til processor:	Min. 1500 V
Aktiveringsspænding (logisk 1):	Nominelt 24 VDC; min. 18 VDC; ønskes andre indgangsniveauer kan formodstanden ændres eller interface-kortet type 6725 kan benyttes
Passiv spænding (logisk 0):	Nominelt 0 VDC; max. 3 VDC
Max. indgangsspænding:	55 VDC
Indgangsimpedans:	Min. 4.7 kohm.
Signal tilslutning:	Via medfølgende stik (varenummer 6721c)

3. Funktionsbeskrivelse

Kortet er opbygget med 30 optokoblere med formodstande og polaritetsbeskyttelses-dioder. Optokoblernes tilstande kan læses af CPU'en via fire driver-kredse; totalt læses 32 bits, herunder anvendes de 30 til optokoblersignalerne. De resterende 2 anvendes til kontrollæsning af, hvorvidt kortet er forbundet til bussen, idet disse 2 bits altid læses som data low. Driverindgangene til disse 2 bits kan strappes (jumper JP) til enten GND eller +5 V. Normalt strappes til GND, men hvis der benyttes inverterende driverkredse for at få aktiv low indgange, strappes til +5 V.

Aktiveringsspændingen for optokoblerindgangene kan ændres ved tilpasning af formodstandene (idet aktiveringsstrømmen skal holdes indenfor specifikationerne for optokoblerne) eller ved anvendelse af interfacekortet type 6725.

Til indikation af, om kanalen er aktiv eller ej, er der anbragt lysdioder (LED's) i serie med aktiveringssignalerne. Lysdioderne er placeret i det medfølgende stik (varenummer 6721c). Ved at sætte lysdioderne i serie med aktiveringssignalet, sikres en bedre kontrolfunktion, end hvis de havde været sat parallelt med signalet.

Kortet er et IPC type 2 kort (typen er programmeret på kortet).

Med 4 IN-instruktioner er det muligt at læse status af de digitale indgange, 8 indgange ad gangen (se skema 3-1), idet dog bit 0 og 1 i instruktionen IN(4n+3) altid er 0 (altid lav), idet de bruges til kontrol af, om kortet er monteret.

Bits i datafeltet	7	6	5	4	3	2	1	0
IN(4n): læs indgang #	0	1	2	3	4	5	6	7
IN(4n+1): læs indgang #	8	9	10	11	12	13	14	15
IN(4n+2): læs indgang #	16	17	18	19	20	21	22	23
IN(4n+3): læs indgang #	24	25	26	27	28	29	lav	lav

Skema 3-1

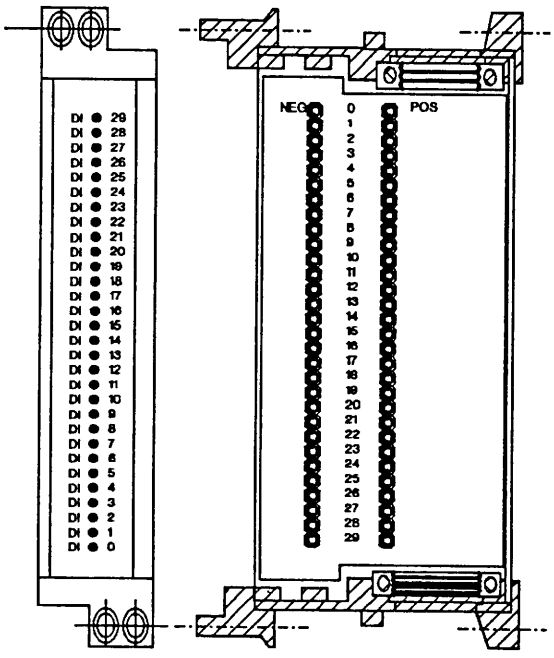
Som vist optager kortet 4 I/O-adresser, dvs. at adresse-switchen SW skal sættes til:

Switch SW:	Digital Input kanal #:
00000000 binært = 0 decimalt	0 - 29
00000100 binært = 4 decimalt	30 - 59
00001000 binært = 8 decimalt	60 - 89
XXXXXX00 binært = 4n decimalt	(30n) - (30n+29), n = 0,1,...,63

4. Mekanisk beskrivelse af board og stik

IPC/1 modulet 6721 består af et board (standard europakort format) samt et periferistik med indbyggede lysdioder. Boardet er afsluttet i en 64-polet DIN-konnektor påmonteret en aluminiums forplolade, der dels muliggør fastspænding i IPC/1 rack, dels muliggør fastspænding af periferistikket.

Signal tilslutningen sker via et medfølgende stik (varenummer 6721c) forsynet med loddeterminaler:



Connections:

Channel #:	Name:	Channel #:	Name:
0 (minus)	NEG 0	15 (minus)	NEG 15
0 (plus)	POS 0	15 (plus)	POS 15
1 (minus)	NEG 1	16 (minus)	NEG 16
1 (plus)	POS 1	16 (plus)	POS 16
2 (minus)	NEG 2	17 (minus)	NEG 17
2 (plus)	POS 2	17 (plus)	POS 17
3 (minus)	NEG 3	18 (minus)	NEG 18
3 (plus)	POS 3	18 (plus)	POS 18
4 (minus)	NEG 4	19 (minus)	NEG 19
4 (plus)	POS 4	19 (plus)	POS 19
5 (minus)	NEG 5	20 (minus)	NEG 20
5 (plus)	POS 5	20 (plus)	POS 20
6 (minus)	NEG 6	21 (minus)	NEG 21
6 (plus)	POS 6	21 (plus)	POS 21
7 (minus)	NEG 7	22 (minus)	NEG 22
7 (plus)	POS 7	22 (plus)	POS 22
8 (minus)	NEG 8	23 (minus)	NEG 23
8 (plus)	POS 8	23 (plus)	POS 23
9 (minus)	NEG 9	24 (minus)	NEG 24
9 (plus)	POS 9	24 (plus)	POS 24
10 (minus)	NEG 10	25 (minus)	NEG 25
10 (plus)	POS 10	25 (plus)	POS 25
11 (minus)	NEG 11	26 (minus)	NEG 26
11 (plus)	POS 11	26 (plus)	POS 26
12 (minus)	NEG 12	27 (minus)	NEG 27
12 (plus)	POS 12	27 (plus)	POS 27
13 (minus)	NEG 13	28 (minus)	NEG 28
13 (plus)	POS 13	28 (plus)	POS 28
14 (minus)	NEG 14	29 (minus)	NEG 29
14 (plus)	POS 14	29 (plus)	POS 29

Manual for

IPC/1 Analog Input Multiplekser (optokobler)

Varenummer 6732o

Dansk Data Elektronik A/S
Januar 1989

Ansvarlig: Gilbert E. Jensen

Indholdsfortegnelse

1. Introduktion

IPC/1 modulet type 6732o er et analogt input multiplexer kort, hvor 15 input multiplekses til 1 udgang. Modulet bruges i forbindelse med IPC/1 Analog Input modulet 6731 (10 bit) eller 6733 (12 bit) og muliggør 120 Analoge Input kanaler pr. 6731/6733 kort.

Modulets processorside er isoleret fra signalsiden, ligesom de enkelte kanaler er indbyrdes isolerede.

Kortet er forsynet med en 8-polet adresse-switch, og det er muligt at have 16 Analoge Input kort i et enkelt IPC/1 system. Dette giver 128 kanaler, hvis kortet bruges uden multipleksere, og op til 1920 kanaler, hvis der benyttes multipleksere på alle Analoge Input kanaler.

Varenummeret dækker over board (varenummer 6732ob) samt periferistik (varenummer 6732oc).

2. Specifikationer

Antal indgange:	15
Antal udgange:	1
Aftastningsprincip:	Lineær optokobler
Kanaladskillelse:	Min. 400 V
Isolation:	Min. 1500 V
Indgangsimpedans:	1 Mohm | 10nF (ved anvendelse af 6733)
Signal input range:	1) 0-1 V direkte 2) 0-20mA (målemodstand kan monteres i medfølgende periferistik type 6732c) 3) Andre strømme og spændinger (ved anvendelse af interface kort 6735)
Signal tilslutning:	Via medfølgende stik (varenummer 6732c).

3. Funktionsbeskrivelse

Kortet er opbygget med 15 optokoblere med dobbelte switches, der selekteres på skift. De dobbelte switches sikrer, at både den negative og positive pol af signalet multiplekses. Til indikation af den valgte kanal, er der anbragt lysdioder i serie med driversignalerne til optokoblerne. Lysdioderne er placeret i det medfølgende stik (varenummer 6732c). Ved at sætte lysdioderne i serie med optokoblerne sikres en bedre kontrolfunktion, end hvis de havde været sat i parallel.

Kortet er et IPC/1 type 5 kort (typen er programmeret på kortet).

Med en OUT-instruktion er det muligt, at aktivere en optokobler specificeret ved de 4 mindst betydende bits i datafeltet (angivet binært). Med en IN-instruktion er det muligt, at læse den aktuelle optokobler stilling (angivet binært) tilbage til CPU'en. Desuden kan indikeringen ^RR (Relay Ready, aktiv lav) og ^CH15 (kanal 15 dekodet, aktiv lav) læses. Bit 5 og 6 i datafeltet er altid 0 (altid lav), idet de bruges til kontrol af, om kortet er monteret.

Bits i datafeltet	7	6	5	4	3	2	1	0
OUT(n): sæt optokob. #					R3	R2	R1	R0
IN(n) : læs optokob. #	^RR	0	0	^CH15	R3	R2	R1	R0

Ved system-reset vil multiplekseren være sat til kanal 0, men indikeringen ^RR vil ikke være sat. Herved sikres en veldefineret startposition med en og kun en optokobler aktiveret.

Der benyttes 1 I/O adresse (basisadresse), som stilles på kortets SW. Afhængig af basisadressen og det tilhørende AI-korts basisadresse, fås følgende logiske Analoge Input kanaler (basisadresserne er skrevet på grå baggrund):

AI-kort (6731/6733)	AI-MUX (6732r/6732o) SW:	Logisk AI kanal nummer:
SW: 00001100 (kort nr. 0) 12	00000000 0	128-142
	00000001 1	143-157
	00000010 2	158-172
	00000011 3	173-187
	00000100 4	188-202
	00000101 5	203-217
	00000110 6	218-232
	00000111 7	233-247
	ingen MUX kort	0-7
SW: 00011100 (kort nr. 1) 28	00010000 16	256-270
	00010001 17	271-285
	00010010 18	286-300
	00010011 19	301-315
	00010100 20	316-330
	00010101 21	331-345
	00010110 22	346-360
	00010111 23	361-375
	ingen MUX kort	8-15
SW: 00101100 (kort nr. 2) 44	00100000 32	384-398
	00100001 33	399-413
	00100010 34	414-428
	00100011 35	429-443
	00100100 36	444-458
	00100101 37	459-473
	00100110 38	474-488
	00100111 39	489-503
	ingen MUX kort	16-23

AI-kort (6731/6733)	AI-MUX (6732r/6732o) SW:	Logisk AI kanal nummer:
SW: 00111100 (kort nr. 3) 60	00110000 48	512-526
	00110001 49	527-541
	00110010 50	542-556
	00110011 51	557-571
	00110100 52	572-586
	00110101 53	587-601
	00110110 54	602-616
	00110111 55	617-631
	ingen MUX kort	24-31
SW: 01001100 (kort nr. 4) 76	01000000 64	640-654
	01000001 65	655-669
	01000010 66	670-684
	01000011 67	685-699
	01000100 68	700-714
	01000101 69	715-729
	01000110 70	730-744
	01000111 71	745-759
	ingen MUX kort	32-39
SW: 01011100 (kort nr. 5) 92	01010000 80	768-782
	01010001 81	783-797
	01010010 82	798-812
	01010011 83	813-827
	01010100 84	828-842
	01010101 85	843-857
	01010110 86	858-872
	01010111 87	873-887
	ingen MUX kort	40-47

AI-kort (6731/6733)	AI-MUX (6732r/6732o) SW:	Logisk AI kanal nummer:
SW: 01101100 (kort nr. 6) 108	01100000 96	896-910
	01100001 97	911-925
	01100010 98	926-940
	01100011 99	941-955
	01100100 100	956-970
	01100101 101	971-985
	01100110 102	986-1000
	01100111 103	1001-1015
	ingen MUX kort	48-55
SW: 01111100 (kort nr. 7) 124	01110000 112	1024-1038
	01110001 113	1039-1053
	01110010 114	1054-1068
	01110011 115	1069-1083
	01110100 116	1084-1098
	01110101 117	1099-1113
	01110110 118	1114-1128
	01110111 119	1129-1143
	ingen MUX kort	56-63
SW: 10001100 (kort nr. 8) 140	10000000 128	1152-1166
	10000001 129	1167-1181
	10000010 130	1182-1196
	10000011 131	1197-1211
	10000100 132	1212-1226
	10000101 133	1227-1241
	10000110 134	1242-1256
	10000111 135	1257-1271
	ingen MUX kort	64-71

AI-kort (6731/6733)	AI-MUX (6732r/6732o) SW:	Logisk AI kanal nummer:
SW: 10011100 (kort nr. 9) 156	10010000 144	1280-1294
	10010001 145	1295-1309
	10010010 146	1310-1324
	10010011 147	1325-1339
	10010100 148	1340-1354
	10010101 149	1355-1369
	10010110 150	1370-1384
	10010111 151	1385-1399
	ingen MUX kort	72-79
SW: 10101100 (kort nr. 10) 172	10100000 160	1408-1422
	10100001 161	1423-1437
	10100010 162	1438-1452
	10100011 163	1453-1467
	10100100 164	1468-1482
	10100101 165	1483-1497
	10100110 166	1498-1512
	10100111 167	1513-1527
	ingen MUX kort	80-87
SW: 10111100 (kort nr. 11) 188	10110000 176	1536-1550
	10110001 177	1551-1565
	10110010 178	1566-1580
	10110011 179	1581-1595
	10110100 180	1596-1610
	10110101 181	1611-1625
	10110110 182	1626-1640
	10110111 183	1641-1655
	ingen MUX kort	88-95

AI-kort (6731/6733)	AI-MUX (6732r/6732o) SW:	Logisk AI kanal nummer:
SW: 11001100 (kort nr. 12) 204	11000000 196 11000001 197 11000010 198 11000011 199 11000100 200 11000101 201 11000110 202 11000111 203 ingen MUX kort	1664-1678 1679-1693 1694-1708 1709-1723 1724-1738 1739-1753 1754-1768 1769-1783 96-103
SW: 11011100 (kort nr. 13) 220	11010000 208 11010001 209 11010010 210 11010011 211 11010100 212 11010101 213 11010110 214 11010111 215 ingen MUX kort	1792-1806 1807-1821 1822-1836 1837-1851 1852-1866 1867-1881 1882-1896 1897-1911 104-111
SW: 11101100 (kort nr. 14) 236	11100000 224 11100001 225 11100010 226 11100011 227 11100100 228 11100101 229 11100110 230 11100111 231 ingen MUX kort	1920-1934 1935-1949 1950-1964 1965-1979 1980-1994 1995-2009 2010-2024 2025-2039 112-119

AI-kort (6731/6733)	AI-MUX (6732r/6732o) SW:	Logisk AI kanal nummer:
SW: 11111100 (kort nr. 15) 252	11110000 240	2048-2062
	11110001 241	2063-2077
	11110010 242	2078-2092
	11110011 243	2093-2107
	11110100 244	2108-2122
	11110101 245	2123-2137
	11110110 246	2138-2152
	11110111 247	2153-2167
	ingen MUX kort	120-127

Logisk AI kanal nummer kan findes ud fra udtrykket:

Logisk AI kanal nummer = 8(AI_BA-12)
(med MUX-kort) + 15((MUX_BA-(AI_BA-12))
+ MUX_KA
+ 128 ,

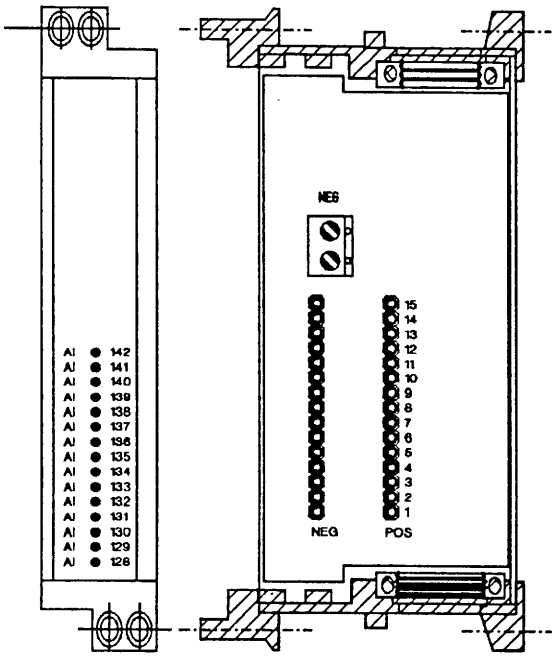
Logisk AI kanal nummer = (AI_BA-12)/2
(uden MUX-kort) + AI_KA

hvor: AI_BA er Analog Input kortets BasisAdresse,
AI_KA er Analog Input kortets KAnalnummer,
MUX_BA er MUltipleXer kortets BasisAdresse
og MUX_KA er MUltipleXer kortets KAnalnummer.

4. Mekanisk beskrivelse af board og stik

IPC/1 modulet 6732o består af et board (standard europakort format) samt et periferistik med indbyggede lysdioder. Boardet er afsluttet i en 96-polet DIN-konnektor påmonteret en aluminiums forplade, der dels muliggør fastspænding i IPC/1 rack, dels muliggør fastspænding af periferistikket.

Signal tilslutning sker via et medfølgende stik (varenummer 6732c) forsynet med loddeterminaler til 15 input kanaler og skrueterminaler til 1 output kanal:



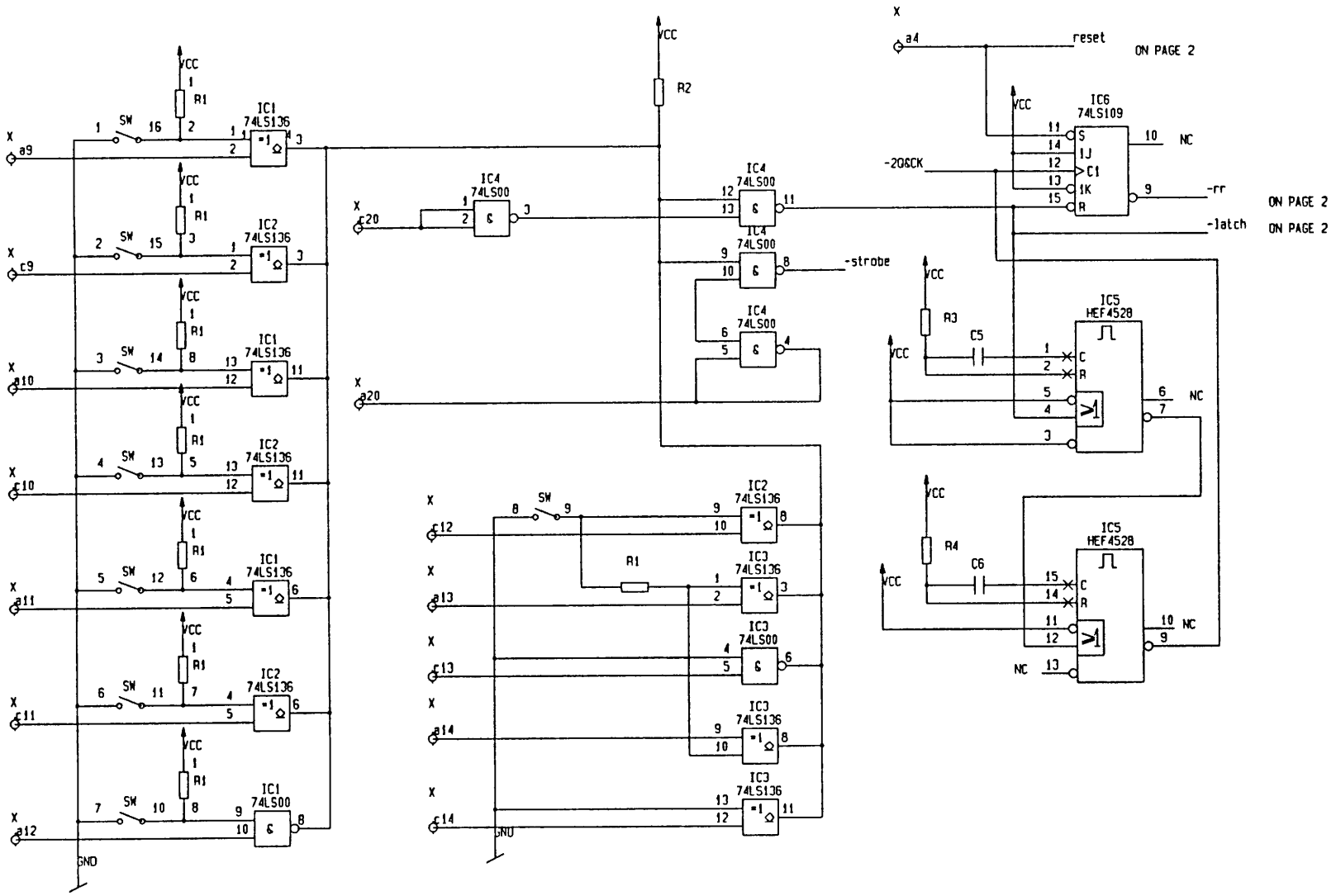
Connections:

Input:

Channel #:	Name:	Channel #:	Name:
128 (minus)	NEG 1	136 (minus)	NEG 9
128 (plus)	POS 1	136 (plus)	POS 9
129 (minus)	NEG 2	137 (minus)	NEG 10
129 (plus)	POS 2	137 (plus)	POS 10
130 (minus)	NEG 3	138 (minus)	NEG 11
130 (plus)	POS 3	138 (plus)	POS 11
131 (minus)	NEG 4	139 (minus)	NEG 12
131 (plus)	POS 4	139 (plus)	POS 12
132 (minus)	NEG 5	140 (minus)	NEG 13
132 (plus)	POS 5	140 (plus)	POS 13
133 (minus)	NEG 6	141 (minus)	NEG 14
133 (plus)	POS 6	141 (plus)	POS 14
134 (minus)	NEG 7	142 (minus)	NEG 15
134 (plus)	POS 7	142 (plus)	POS 15
135 (minus)	NEG 8		
135 (plus)	POS 8		

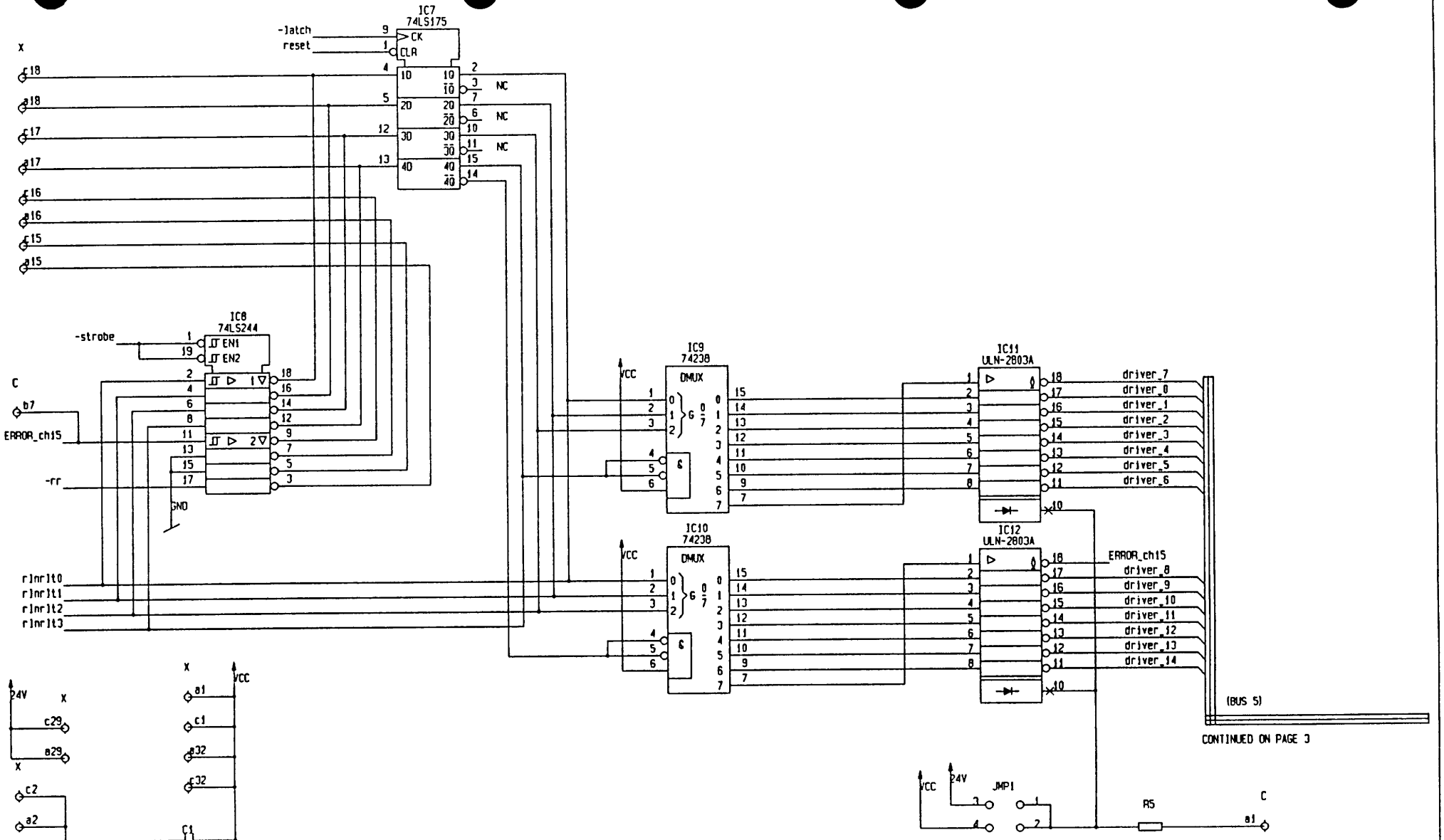
Output (to Analogue Input):

Channel #:	Name:
0 (minus)	NEG
0 (plus)	POS



dde dansk data elektronik a/s Herlev hoved gade 199 . 2730 Herlev	sheet of	scale	
	drawn E. Z.	approved	
	date 890206	Issue 1	
IPC/6732	dwg. no. A3 6732	assy. rev.	1
		pcb rev.	

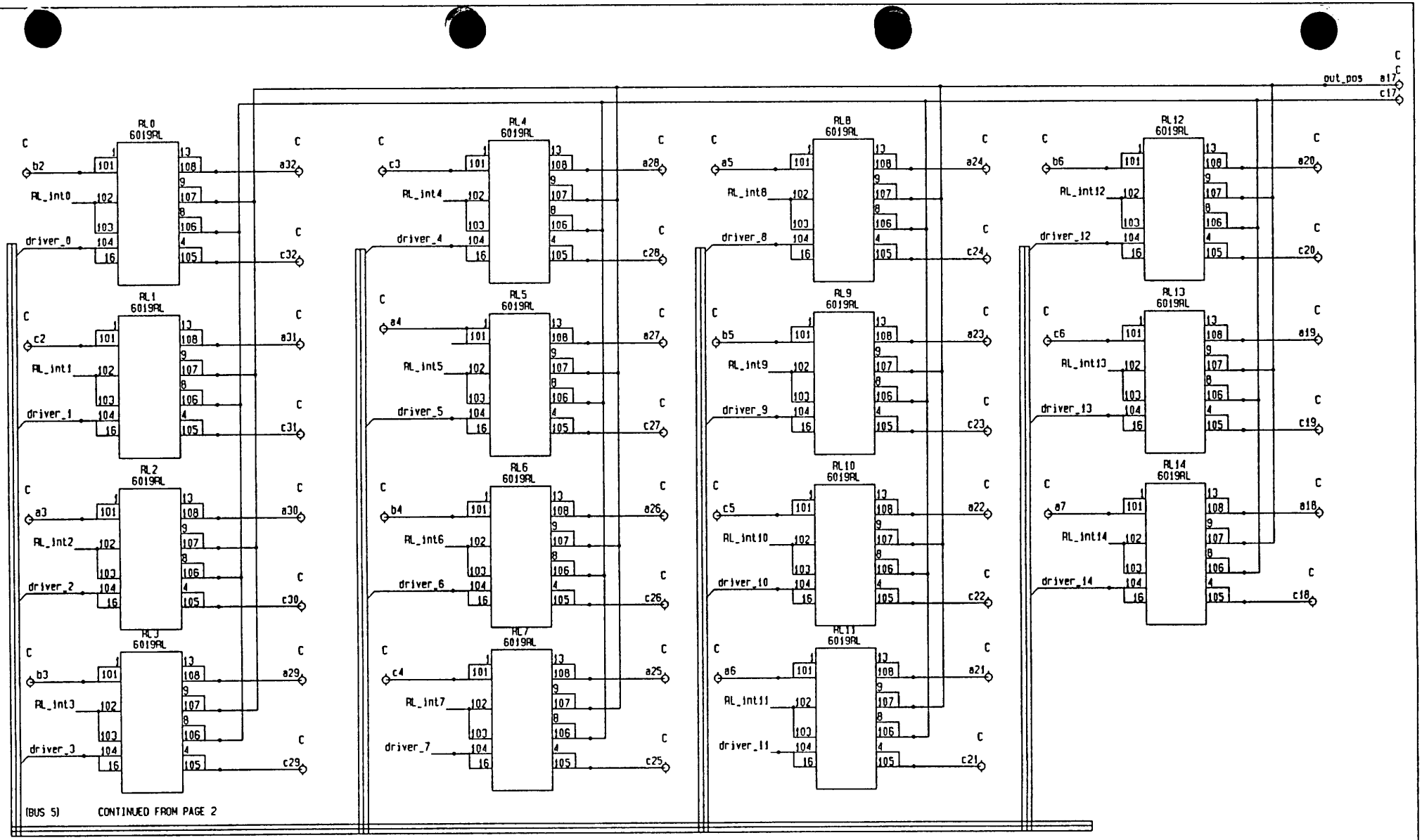
6732a Date 06 02 1989 Time 16 02 29 Scale:1 00



dde dansk data elektronik a/s Herlev hoved gade 199 . 2730 Herlev	sheet a2	scale	
	drawn E. Z.	approved	
	date 890206	Issue 1	
IPC/1 6732	dwg. no. A3 6732	assy. rev.	1
		pcb rev.	

Date 06.02.1989 Time 16:42:38 Scale:1.00

67320



dde dansk data elektronik a/s Herlev hoved gade 199 . 2730 Herlev	sheet 03	scale	
	drawn E. Z.	approved	
	date 890206	Issue	1
IPC/1 6732	dwg.no. A3 6732	assy. rev.	1
		pcb rev.	

6732c Date 06.02.1989 Time 15:40:41 Scale:1.00

Manual for

IPC/1 Analog Input Multiplekser (relæudgave)

Varenummer 6732r

Dansk Data Elektronik A/S
Januar 1989

Ansvarlig: Gilbert E. Jensen

Indholdsfortegnelse

1. Introduktion

IPC/1 modulet type 6732r er et analogt input multiplexer kort, hvor 15 input multiplekses til en udgang. Modulet bruges i forbindelse med IPC/1 Analog Input modulet 6731 (10 bit) eller 6733 (12 bit) og muliggør 120 Analoge Input kanaler pr. 6731/6733 kort.

Modulets processorside er isoleret fra signalsiden, ligesom de enkelte kanaler er indbyrdes isolerede.

Kortet er forsynet med en 8-polet adresse-switch, og det er muligt at have 16 Analoge Input kort i et enkelt IPC/1 system. Dette giver 128 kanaler, hvis kortet bruges uden multipleksere, og op til 1920 kanaler, hvis der benyttes multipleksere på alle Analoge Input kanaler.

Varenummeret dækker over board (varenummer 6732rb) samt periferistik (varenummer 6732rc).

2. Specifikationer

Antal indgange:	15
Antal udgange:	1
Aftastningsprincip:	Relæ multiplekser
Kanaladskillelse:	Min. 400 V
Isolation:	Min. 1500 V
Indgangsimpedans:	10 Mohm | 10nF (ved anvendelse af 6731)
Signal input range:	1) 0-1 V direkte 2) 0-20mA (målemodstand kan monteres i medfølgende periferistik type 6732c) 3) Andre strømme og spændinger (ved anvendelse af interface kort 6735)
Signal tilslutning:	Via medfølgende stik (varenummer 6732c).

3. Funktionsbeskrivelse

Kortet er opbygget med 15 relæer med dobbelte skiftekontakter, der selekteres på skift. De dobbelte skiftekontakter sikrer, at både den negative og positive pol af signalet multiplekses. Til indikation af den valgte kanal, er der anbragt lysdioder i serie med driversignalerne til relæspolerne. Lysdioderne er placeret i det medfølgende stik (varenummer 6732c). Ved at sætte lysdioderne i serie med spolesignalet sikres en bedre kontrolfunktion, end hvis de havde været sat i parallel.

Kortet er et IPC type 5 kort (typen er programmeret på kortet).

Med en OUT-instruktion er det muligt, at aktivere et relæ specificeret ved de 4 mindst betydende bits i datafeltet (angivet binært). Med en IN-instruktion er det muligt, at læse den aktuelle relæ- stilling (angivet binært) tilbage til CPU'en. Desuden kan indikeringen ^RR (Relay Ready, aktiv lav) og ^CH15 (kanal 15 dekodet, aktiv lav) læses. Bit 5 og 6 i datafeltet er altid 0 (altid lav), idet de bruges til kontrol af, om kortet er monteret.

Bits i datafeltet	7	6	5	4	3	2	1	0
OUT(n): sæt relænummer					R3	R2	R1	R0
IN(n) : læs relænummer	^RR	0	0	^CH15	R3	R2	R1	R0

Ved system-reset vil multiplekseren være sat til kanal 0, men indikeringen ^RR vil ikke være sat. Herved sikres en veldefineret startposition med et og kun et relæ trukket.

Der benyttes 1 I/O adresse (basisadresse), som stilles på kortets SW. Afhængig af basisadressen og det tilhørende AI-korts basisadresse, fås følgende logiske Analoge Input kanaler (basisadresserne er skrevet på grå baggrund):

AI-kort (6731/6733)	AI-MUX (6732r/6732o) SW:	Logisk AI kanal nummer:
SW: 00001100 (kort nr. 0) 12	00000000 0	128-142
	00000001 1	143-157
	00000010 2	158-172
	00000011 3	173-187
	00000100 4	188-202
	00000101 5	203-217
	00000110 6	218-232
	00000111 7	233-247
	ingen MUX kort	0-7
SW: 00011100 (kort nr. 1) 28	00010000 16	256-270
	00010001 17	271-285
	00010010 18	286-300
	00010011 19	301-315
	00010100 20	316-330
	00010101 21	331-345
	00010110 22	346-360
	00010111 23	361-375
	ingen MUX kort	8-15
SW: 00101100 (kort nr. 2) 44	00100000 32	384-398
	00100001 33	399-413
	00100010 34	414-428
	00100011 35	429-443
	00100100 36	444-458
	00100101 37	459-473
	00100110 38	474-488
	00100111 39	489-503
	ingen MUX kort	16-23

AI-kort (6731/6733)	AI-MUX (6732r/6732o) SW:	Logisk AI kanal nummer:
SW: 00111100 (kort nr. 3) 60	00110000 48	512-526
	00110001 49	527-541
	00110010 50	542-556
	00110011 51	557-571
	00110100 52	572-586
	00110101 53	587-601
	00110110 54	602-616
	00110111 55	617-631
	ingen MUX kort	24-31
SW: 01001100 (kort nr. 4) 76	01000000 64	640-654
	01000001 65	655-669
	01000010 66	670-684
	01000011 67	685-699
	01000100 68	700-714
	01000101 69	715-729
	01000110 70	730-744
	01000111 71	745-759
	ingen MUX kort	32-39
SW: 01011100 (kort nr. 5) 92	01010000 80	768-782
	01010001 81	783-797
	01010010 82	798-812
	01010011 83	813-827
	01010100 84	828-842
	01010101 85	843-857
	01010110 86	858-872
	01010111 87	873-887
	ingen MUX kort	40-47

AI-kort (6731/6733)	AI-MUX (6732r/6732o) SW:	Logisk AI kanal nummer:
SW: 01101100 (kort nr. 6) 108	01100000 96	896-910
	01100001 97	911-925
	01100010 98	926-940
	01100011 99	941-955
	01100100 100	956-970
	01100101 101	971-985
	01100110 102	986-1000
	01100111 103	1001-1015
	ingen MUX kort	48-55
SW: 01111100 (kort nr. 7) 124	01110000 112	1024-1038
	01110001 113	1039-1053
	01110010 114	1054-1068
	01110011 115	1069-1083
	01110100 116	1084-1098
	01110101 117	1099-1113
	01110110 118	1114-1128
	01110111 119	1129-1143
	ingen MUX kort	56-63
SW: 10001100 (kort nr. 8) 140	10000000 128	1152-1166
	10000001 129	1167-1181
	10000010 130	1182-1196
	10000011 131	1197-1211
	10000100 132	1212-1226
	10000101 133	1227-1241
	10000110 134	1242-1256
	10000111 135	1257-1271
	ingen MUX kort	64-71

AI-kort (6731/6733)	AI-MUX (6732r/6732o) SW:	Logisk AI kanal nummer:
SW: 10011100 (kort nr. 9) 156	10010000 144	1280-1294
	10010001 145	1295-1309
	10010010 146	1310-1324
	10010011 147	1325-1339
	10010100 148	1340-1354
	10010101 149	1355-1369
	10010110 150	1370-1384
	10010111 151	1385-1399
	ingen MUX kort	72-79
SW: 10101100 (kort nr. 10) 172	10100000 160	1408-1422
	10100001 161	1423-1437
	10100010 162	1438-1452
	10100011 163	1453-1467
	10100100 164	1468-1482
	10100101 165	1483-1497
	10100110 166	1498-1512
	10100111 167	1513-1527
	ingen MUX kort	80-87
SW: 10111100 (kort nr. 11) 188	10110000 176	1536-1550
	10110001 177	1551-1565
	10110010 178	1566-1580
	10110011 179	1581-1595
	10110100 180	1596-1610
	10110101 181	1611-1625
	10110110 182	1626-1640
	10110111 183	1641-1655
	ingen MUX kort	88-95

AI-kort (6731/6733)	AI-MUX (6732r/6732o) SW:	Logisk AI kanal nummer:
SW: 11001100 (kort nr. 12) 204	11000000 196	1664-1678
	11000001 197	1679-1693
	11000010 198	1694-1708
	11000011 199	1709-1723
	11000100 200	1724-1738
	11000101 201	1739-1753
	11000110 202	1754-1768
	11000111 203	1769-1783
	ingen MUX kort	96-103
SW: 11011100 (kort nr. 13) 220	11010000 208	1792-1806
	11010001 209	1807-1821
	11010010 210	1822-1836
	11010011 211	1837-1851
	11010100 212	1852-1866
	11010101 213	1867-1881
	11010110 214	1882-1896
	11010111 215	1897-1911
	ingen MUX kort	104-111
SW: 11101100 (kort nr. 14) 236	11100000 224	1920-1934
	11100001 225	1935-1949
	11100010 226	1950-1964
	11100011 227	1965-1979
	11100100 228	1980-1994
	11100101 229	1995-2009
	11100110 230	2010-2024
	11100111 231	2025-2039
	ingen MUX kort	112-119

AI-kort (6731/6733)	AI-MUX (6732r/6732o) SW:	Logisk AI kanal nummer:
SW: 11111100 (kort nr. 15) 252	11110000 240	2048-2062
	11110001 241	2063-2077
	11110010 242	2078-2092
	11110011 243	2093-2107
	11110100 244	2108-2122
	11110101 245	2123-2137
	11110110 246	2138-2152
	11110111 247	2153-2167
	ingen MUX kort	120-127

Logisk AI kanal nummer kan findes ud fra udtrykket:

Logisk AI kanal nummer = 8(AI_BA-12)
(med MUX-kort) + 15((MUX_BA-(AI_BA-12))
+ MUX_KA
+ 128 ,

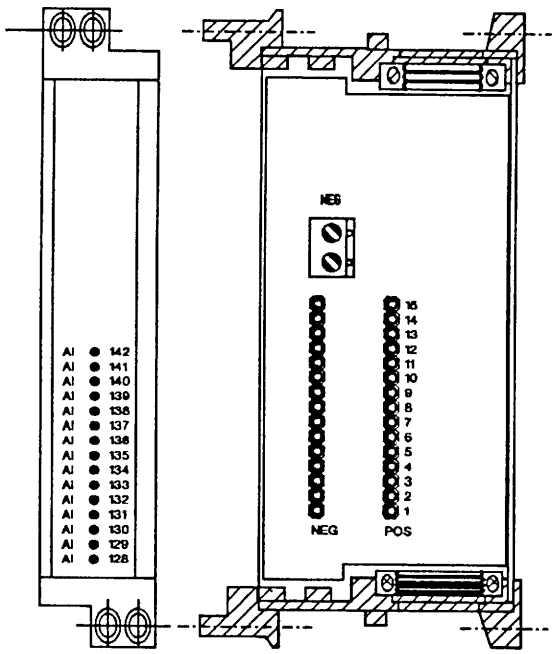
Logisk AI kanal nummer = (AI_BA-12)/2
(uden MUX-kort) + AI_KA

hvor: AI_BA er Analog Input kortets BasisAdresse,
AI_KA er Analog Input kortets KAnalnummer,
MUX_BA er MUltipleXer kortets BasisAdresse
og MUX_KA er MUltipleXer kortets KAnalnummer.

4. Mekanisk beskrivelse af board og stik

IPC/1 modulet 6732r består af et board (standard europakort format) samt et periferistik med indbyggede lysdioder. Boardet er afsluttet i en 96-polet DIN-konnektor påmonteret 2 specielle flanger, der dels muliggør fastspænding i IPC/1 rack, dels muliggør fastspænding af periferistikket.

Signal tilslutning sker via et medfølgende stik (varenummer 6732c) forsynet med loddeterminaler til 15 input kanaler og skrueterminaler til 1 output kanal:



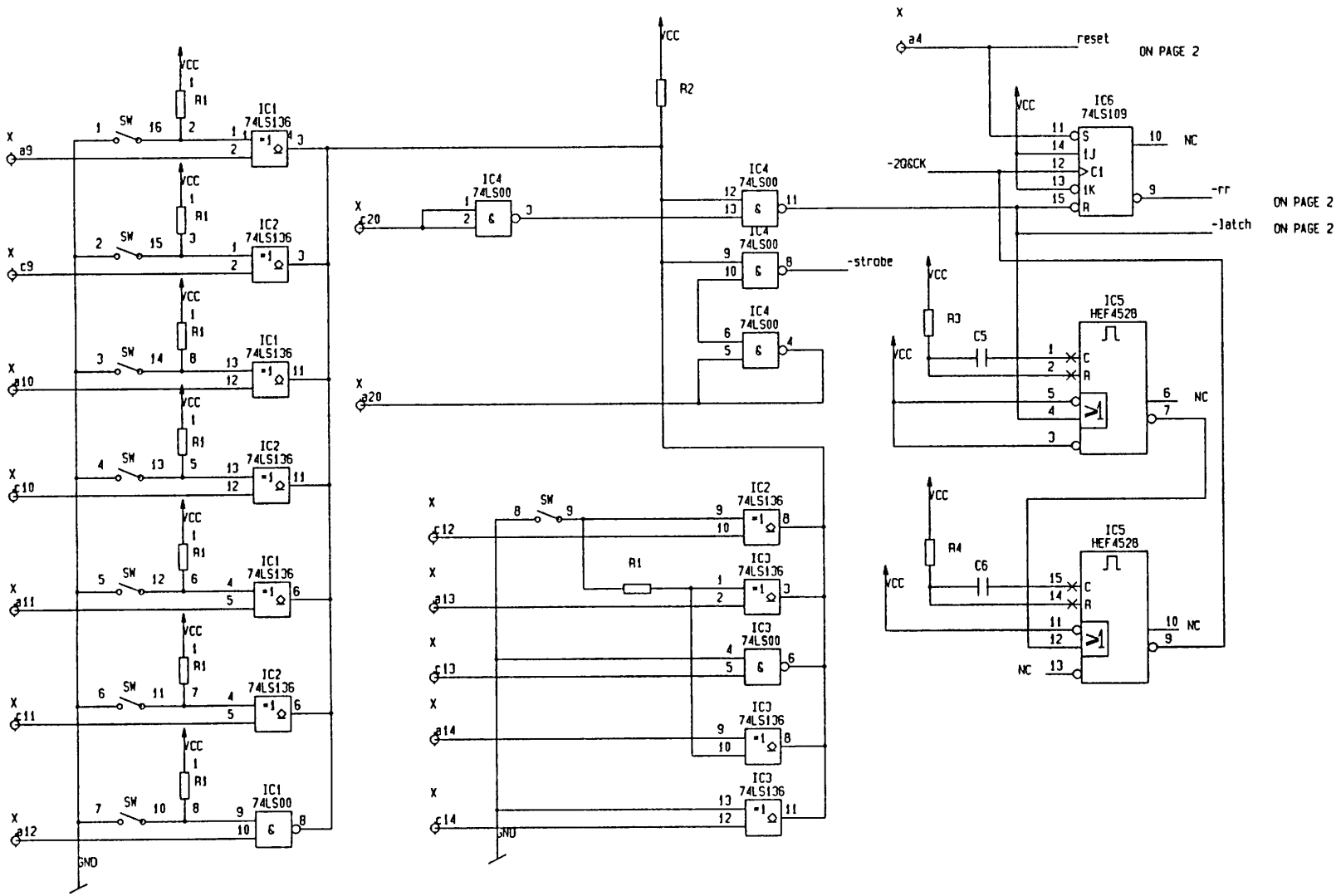
Connections:

Input:

Channel #:	Name:	Channel #:	Name:
128 (minus)	NEG 1	136 (minus)	NEG 9
128 (plus)	POS 1	136 (plus)	POS 9
129 (minus)	NEG 2	137 (minus)	NEG 10
129 (plus)	POS 2	137 (plus)	POS 10
130 (minus)	NEG 3	138 (minus)	NEG 11
130 (plus)	POS 3	138 (plus)	POS 11
131 (minus)	NEG 4	139 (minus)	NEG 12
131 (plus)	POS 4	139 (plus)	POS 12
132 (minus)	NEG 5	140 (minus)	NEG 13
132 (plus)	POS 5	140 (plus)	POS 13
133 (minus)	NEG 6	141 (minus)	NEG 14
133 (plus)	POS 6	141 (plus)	POS 14
134 (minus)	NEG 7	142 (minus)	NEG 15
134 (plus)	POS 7	142 (plus)	POS 15
135 (minus)	NEG 8		
135 (plus)	POS 8		

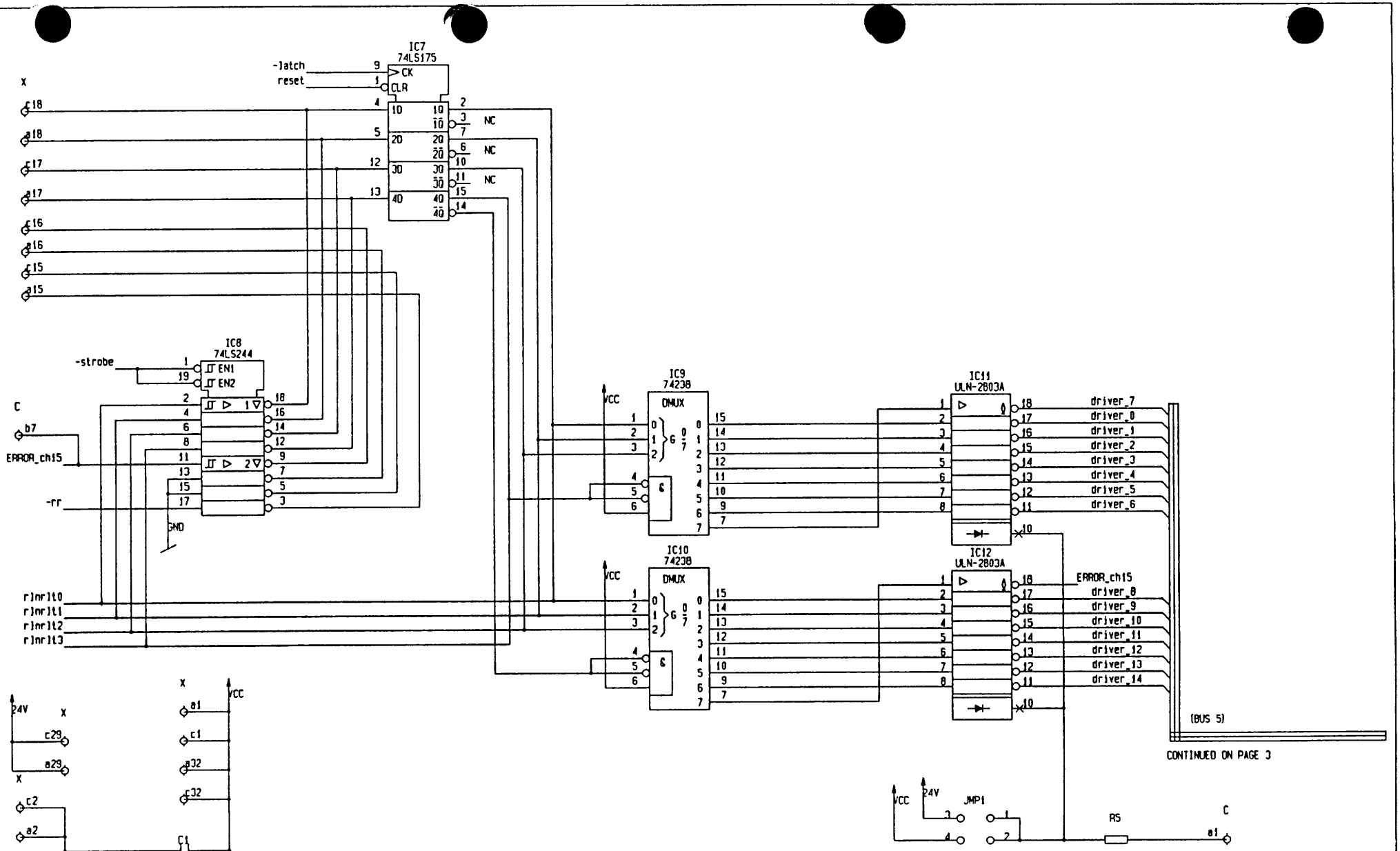
Output (to Analogue Input):

Channel #:	Name:
0 (minus)	NEG
0 (plus)	POS



dde dansk data elektronik a/s Herlev hoved gade 199 , 2730 Herlev	sheet 01	scale	
	drawn E. Z.	approved	
	date 890206	Issue 1	
IPC/6732	dwg. no. A3 6732	assy. rev.	1
		pcb rev.	

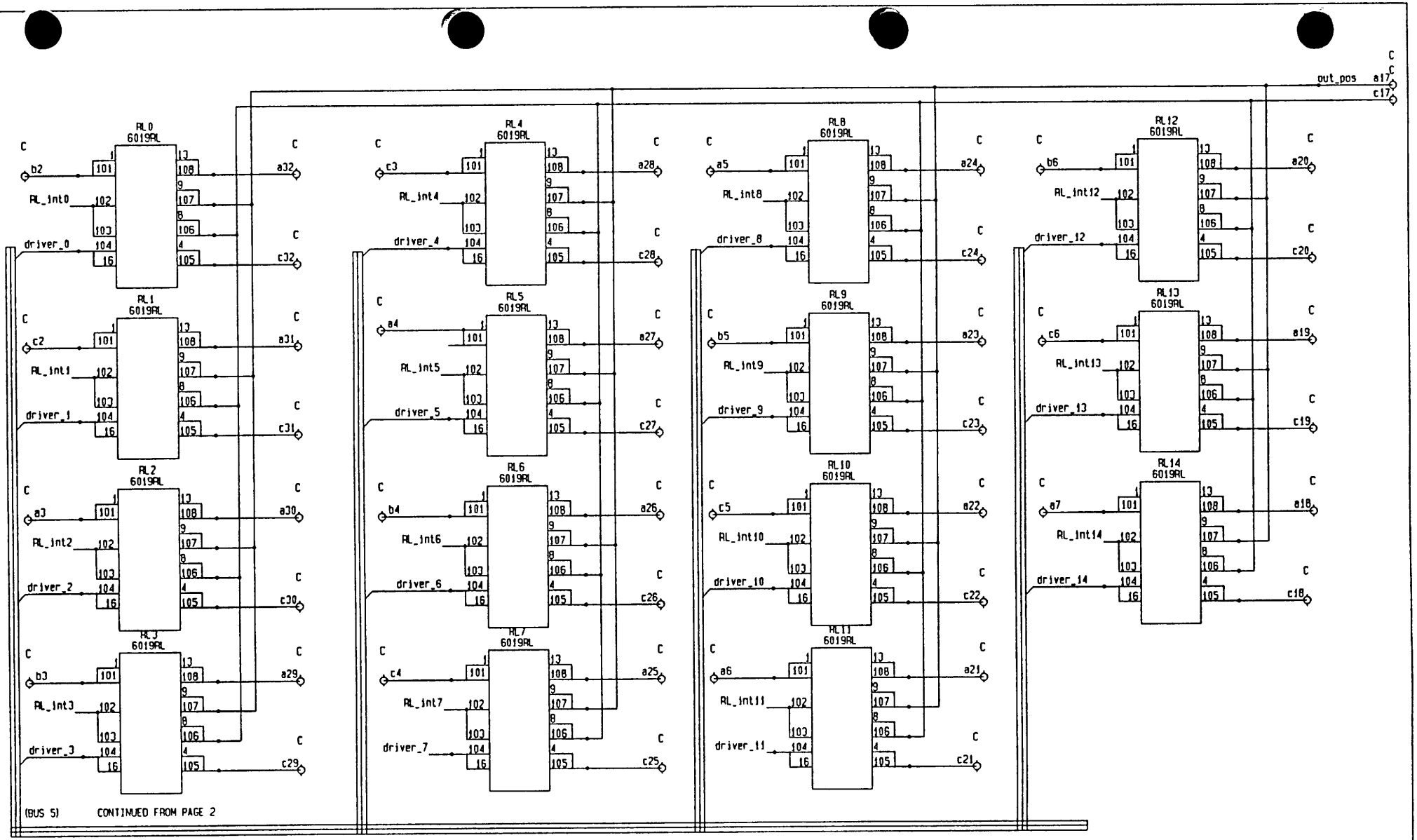
6732a Date 06 02 1989 Time 16 02:29 Scale:1.00



dde — dansk data elektronik a/s, Herlev hoved gade 199 . 2730 Herlev	sheet a2	scale	
	drawn E. Z.	approved	
	date 890206	Issue 1	
IPC/1 6732	dwg. no. A3 6732	assy. rev.	1
		pcb rev.	

Date: 06 02 1989 Time: 16:42:38 Scale: 1.00

6732b



dde dansk data elektronik a/s Herlev hoved gade 199 . 2730 Herlev	sheet 03	scale	
	drawn E. Z.	approved	
	date 890206	issue	1
IPC/1 6732	dwg. no. A3 6732	assy. rev.	1
		pcb rev.	

6732c Date 06 02 1989 Time 15:40:41 Scale:1.00

Manual for

IPC/1 Analog Input Modul (12 bit)

Varenummer 6733

Dansk Data Elektronik A/S
Januar 1989

Ansvarlig: Gilbert E. Jensen

Indholdsfortegnelse

1. Introduktion

IPC/1 modulet type 6733 er et 12-bit analogt input kort, med 8 input kanaler. Modulet bruges enten seperat eller i forbindelse med IPC/1 Analog Input Multiplekser modulet 6732r eller 6732o. Analog Input Multiplekser modulets output forbindes til Analog Input modulets input, hvorved der kan opnås 15 multipleksede kanaler for hver input kanal på Analog Input modulet. På denne måde kan der opnås 120 Analoge Input kanaler pr. 6733 kort, når dette forbindes med 8 Analog Input Multiplekser moduler af typen 6732r/6732o.

Modulets processorside er isoleret fra signalsiden, ligesom de enkelte kanaler er indbyrdes isolerede.

Kortet er forsynet med en 8-polet adresse-switch, og det er muligt at have 16 Analoge Input kort i et enkelt IPC/1 system. Dette giver 128 kanaler, hvis kortet bruges uden multipleksere, og op til 1920 kanaler, hvis der benyttes multipleksere på alle Analoge Input kanaler.

Varenummeret dækker over board (varenummer 6733b) samt periferistik (varenummer 6733c).

2. Specifikationer

Antal bits:	12
Konverteringstid:	15 µs
Antal indgange:	8
Aftastningsprincip:	Multipleksede solide-state switches (optokobler indgange)
Kanaladskillelse:	Min. 400 V
Isolation:	Min. 1500 V
Indgangsimpedans:	1 Mohm | 10nF
Signal input range:	1) 0-1 V direkte 2) 0-20mA (målemodstand kan monteres i medfølgende periferistik type 6733c) 3) Andre strømme og spændinger (ved anvendelse af interface kort 6735)
Signal tilslutning:	Via medfølgende stik (varenummer 6733c).

3. Funktionsbeskrivelse

Kortet er opbygget med 8 optokoblere med dobbelte switch-kontakter, der selekteres på skift. De dobbelte switch-kontakter sikrer, at både den negative og positive pol af signalet multiplekses. Til indikation af den valgte kanal, er der anbragt lysdioder i serie med driversignalerne til optokoblerne. Lysdioderne er placeret i det medfølgende periferistik. Ved at sætte lysdioderne i serie med optokoblerne sikres en bedre kontrolfunktion, end hvis de havde været sat i parallel. Såfremt brugeren vælger en løsning uden periferistikket, skal der tages hensyn til denne konstruktionsmæssige detalje, f.eks. ved at forbinde alle driversignalerne til ben a1 på boardets udgangskonnektor.

Kortet er et IPC/1 type 7 kort. Kortet er af kompatibilitets hensyn lavet således, at typen kan sættes til:

*) type 4: emulere 10 bits kort (varenummer 6731)
*) type 7: 12 bits kort (varenummer 6733)

Med en OUT-instruktion er det muligt, at aktivere en optokobler specificeret ved de 4 mindst betydende bits i datafeltet (angivet binært). En anden OUT-instruktion starter konverteringen.

Med en IN-instruktion er det muligt, at læse status af kortet tilbage til CPU'en. Denne status omfatter indikeringen ^RR (Relay Ready, aktiv lav) og ^DR (Data Ready, aktiv lav) samt optokobler-stillingen, dvs. selekterede kanal (angivet binært). Bit 5 i datafeltet er altid 0 (altid lav), idet det bruges til kontrol af, om kortet er monteret.

Bits i datafeltet	7	6	5	4	3	2	1	0
OUT(4n+1): sæt kanalnummer	X	X	X	X	R3	R2	R1	R0
OUT(4n) : start konvert.	X	X	X	X	X	X	X	X
IN(4n) : læs status	^RR	^DR	0	X	R3	R2	R1	R0
IN(4n+1) : læs DB0-DB7	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
IN(4n+2) : læs DB8-DB11	X	X	X	X	DB11	DB10	DB9	DB8

Ved system-reset vil multiplekseren være sat til kanal 0, men indikeringen ^RR vil ikke være sat.
Herved sikres en veldefineret startposition med en og kun en kanal aktiveret.

Der benyttes 1 I/O adresse (basisadresse), som stilles på kortets SW. Afhængig af basisadressen og de tilhørende 6732r/6732o's basisadresse, fås følgende logiske Analoge Input kanaler med basisadresserne skrevet på grå baggrund (se næste side):

AI-kort (6733)	AI-MUX (6732r/ 6732o) SW	Logisk AI kanal nummer:
SW: 00001100 (kort nr. 0) 12 (0C)	00000000 0 00000001 1 00000010 2 00000011 3 00000100 4 00000101 5 00000110 6 00000111 7 ingen MUX kort	128-142 143-157 158-172 173-187 188-202 203-217 218-232 233-247 0-7
SW: 00011100 (kort nr. 1) 28	00010000 16 00010001 17 00010010 18 00010011 19 00010100 20 00010101 21 00010110 22 00010111 23 ingen MUX kort	256-270 271-285 286-300 301-315 316-330 331-345 346-360 361-375 8-15
SW: 00101100 (kort nr. 2) 44	00100000 32 00100001 33 00100010 34 00100011 35 00100100 36 00100101 37 00100110 38 00100111 39 ingen MUX kort	384-398 399-413 414-428 429-443 444-458 459-473 474-488 489-503 16-23

AI-kort (6733)	AI-MUX (6732r/ 6732o) SW	Logisk AI kanal nummer:
SW: 00111100 (kort nr. 3) 60	00110000 48	512-526
	00110001 49	527-541
	00110010 50	542-556
	00110011 51	557-571
	00110100 52	572-586
	00110101 53	587-601
	00110110 54	602-616
	00110111 55	617-631
	ingen MUX kort	24-31
SW: 01001100 (kort nr. 4) 76	01000000 64	640-654
	01000001 65	655-669
	01000010 66	670-684
	01000011 67	685-699
	01000100 68	700-714
	01000101 69	715-729
	01000110 70	730-744
	01000111 71	745-759
	ingen MUX kort	32-39
SW: 01011100 (kort nr. 5) 92	01010000 80	768-782
	01010001 81	783-797
	01010010 82	798-812
	01010011 83	813-827
	01010100 84	828-842
	01010101 85	843-857
	01010110 86	858-872
	01010111 87	873-887
	ingen MUX kort	40-47

AI-kort (6733)	AI-MUX (6732r/ 6732o) SW	Logisk AI kanal nummer:
SW: 01101100 (kort nr. 6) 108	01100000 96	896-910
	01100001 97	911-925
	01100010 98	926-940
	01100011 99	941-955
	01100100 100	956-970
	01100101 101	971-985
	01100110 102	986-1000
	01100111 103	1001-1015
	ingen MUX kort	48-55
SW: 01111100 (kort nr. 7) 124	01110000 112	1024-1038
	01110001 113	1039-1053
	01110010 114	1054-1068
	01110011 115	1069-1083
	01110100 116	1084-1098
	01110101 117	1099-1113
	01110110 118	1114-1128
	01110111 119	1129-1143
	ingen MUX kort	56-63
SW: 10001100 (kort nr. 8) 140	10000000 128	1152-1166
	10000001 129	1167-1181
	10000010 130	1182-1196
	10000011 131	1197-1211
	10000100 132	1212-1226
	10000101 133	1227-1241
	10000110 134	1242-1256
	10000111 135	1257-1271
	ingen MUX kort	64-71

AI-kort (6733)	AI-MUX (6732r/ 6732o) SW	Logisk AI kanal nummer:
SW: 10011100 (kort nr. 9) 156	10010000 144	1280-1294
	10010001 145	1295-1309
	10010010 146	1310-1324
	10010011 147	1325-1339
	10010100 148	1340-1354
	10010101 149	1355-1369
	10010110 150	1370-1384
	10010111 151	1385-1399
	ingen MUX kort	72-79
SW: 10101100 (kort nr. 10) 172	10100000 160	1408-1422
	10100001 161	1423-1437
	10100010 162	1438-1452
	10100011 163	1453-1467
	10100100 164	1468-1482
	10100101 165	1483-1497
	10100110 166	1498-1512
	10100111 167	1513-1527
	ingen MUX kort	80-87
SW: 10111100 (kort nr. 11) 188	10110000 176	1536-1550
	10110001 177	1551-1565
	10110010 178	1566-1580
	10110011 179	1581-1595
	10110100 180	1596-1610
	10110101 181	1611-1625
	10110110 182	1626-1640
	10110111 183	1641-1655
	ingen MUX kort	88-95

AI-kort (6733)	AI-MUX (6732r/ 6732o) SW	Logisk AI kanal nummer:
SW: 11001100 (kort nr. 12) 204	11000000 196	1664-1678
	11000001 197	1679-1693
	11000010 198	1694-1708
	11000011 199	1709-1723
	11000100 200	1724-1738
	11000101 201	1739-1753
	11000110 202	1754-1768
	11000111 203	1769-1783
	ingen MUX kort	96-103
SW: 11011100 (kort nr. 13) 220	11010000 208	1792-1806
	11010001 209	1807-1821
	11010010 210	1822-1836
	11010011 211	1837-1851
	11010100 212	1852-1866
	11010101 213	1867-1881
	11010110 214	1882-1896
	11010111 215	1897-1911
	ingen MUX kort	104-111
SW: 11101100 (kort nr. 14) 236	11100000 224	1920-1934
	11100001 225	1935-1949
	11100010 226	1950-1964
	11100011 227	1965-1979
	11100100 228	1980-1994
	11100101 229	1995-2009
	11100110 230	2010-2024
	11100111 231	2025-2039
	ingen MUX kort	112-119

AI-kort (6733)	AI-MUX (6732r/ 6732o) SW	Logisk AI kanal nummer:
SW: 11111100 (kort nr. 15) 252	11110000 240	2048-2062
	11110001 241	2063-2077
	11110010 242	2078-2092
	11110011 243	2093-2107
	11110100 244	2108-2122
	11110101 245	2123-2137
	11110110 246	2138-2152
	11110111 247	2153-2167
	ingen MUX kort	120-127

Logisk AI kanal nummer kan findes ud fra udtrykket:

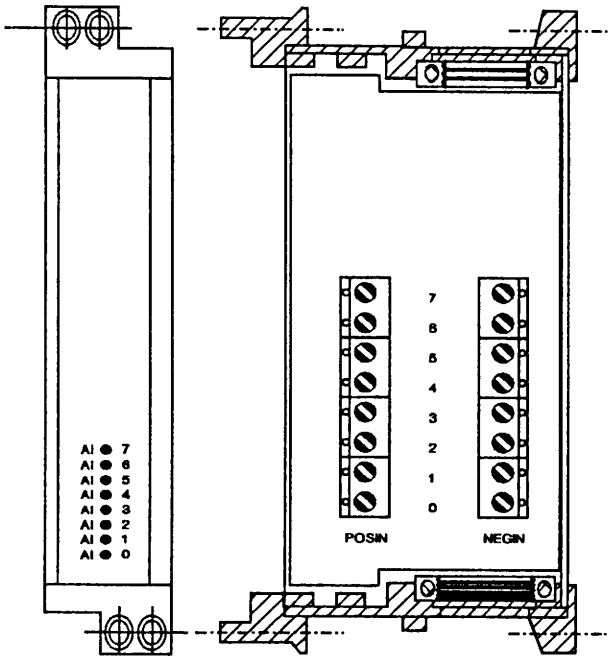
```
Logisk AI kanal nummer = 8(AI_BA-12)
(med MUX-kort)         + 15((MUX_BA-(AI_BA-12))
                       + MUX_KA
                       + 128

Logisk AI kanal nummer = (AI_BA-12)/2
(uden MUX-kort)        + AI_KA
```

hvor: AI_BA er Analog Input kortets BasisAdresse,
AI_KA er Analog Input kortets KAnalnummer,
MUX_BA er MUltipleXer kortets BasisAdresse
og MUX_KA er MUltipleXer kortets KAnalnummer.

4. Mekanisk beskrivelse af board og stik

IPC/1 modulet 6733 består af et board (standard europakort format) samt et periferistik med indbyggede lysdioder. Boardet er afsluttet i en 96-polet DIN-konnektor påmonteret en aluminiums forplade, der dels muliggør fastspænding i IPC/1 rack, dels muliggør fastspænding af periferistikket.

Signal tilslutningen sker via et medfølgende stik forsynet med skrueterminaler:



Connections:

Channel #:	Name:
0 (minus)	0 NEGIN
0 (plus)	0 POSIN
1 (minus)	1 NEGIN
1 (plus)	1 POSIN
2 (minus)	2 NEGIN
2 (plus)	2 POSIN
3 (minus)	3 NEGIN
3 (plus)	3 POSIN
4 (minus)	4 NEGIN
4 (plus)	4 POSIN
5 (minus)	5 NEGIN
5 (plus)	5 POSIN
6 (minus)	6 NEGIN
6 (plus)	6 POSIN
7 (minus)	7 NEGIN
7 (plus)	7 POSIN

Name	Type	Pos
C	DIN C96 MA *	A13
C1	47uF / 16V	A2
C2	47uF / 16V	A6
C3	47uF / 16V	A5
C4	10uF / 25V	C8
C5	10uF / 25V	E8
C6	10uF / 25V	B7
C7	10uF / 25V	B7
C8	10uF / 25V	C7
C9	100nF	C8
C10	10uF / 25V	B6
C11	100nF	E8
C12	100nF	B8
C13	100nF	B7
C14	100nF	C7
C15	10uF / 25V	A7
C16	100nF	A7
C17	100nF	C8
C18	1n5F	C4
C19	22nF	H4
C20	22nF	H7
C21	100nF	C7
C22	100pF	D7
C23	100pF	D7
C24	100nF	B6
IC1	74LS136N	F2
IC2	74LS136N	G2
IC3	74LS136N	E2
IC4	74LS00	E4
IC5	74LS139N	D4
IC6	74LS123N	C4
IC7	74LS109AN	F4
IC8	74LS109AN	D4
IC9	HEF4528BP	H4
IC10	74LS109AN	G4
IC11	74HC4514	F6
IC12	ULN2803A (OPTIONAL)	F8
IC13	ULN2803A	F7
IC14	OAA160 (OPTIONAL)	B11
IC15	OAA160 (OPTIONAL)	C11
IC16	OAA160 (OPTIONAL)	C10
IC17	OAA160 (OPTIONAL)	D11
IC18	OAA160 (OPTIONAL)	D10
IC19	OAA160 (OPTIONAL)	E11
IC20	OAA160 (OPTIONAL)	E10
IC21	OAA160	E11
IC22	OAA160	E10
IC23	OAA160	F11
IC24	OAA160	F10
IC25	OAA160	G11
IC26	OAA160	G10
IC27	OAA160	H11
IC28	OAA160	H10
IC29	74LS244N	C2
IC30	74LS244N	D2
IC31	74LS244N	D2
IC32	NMA0515D	B4
IC33	AD202KY	A9
IC34	AD585AQ	C7
IC35	AD7572LN12	C6
IC36	74LS74A	B2
IC37	AD584LH (OPTIONAL)	A6
IC38	OAA160 (OPTIONAL)	B10
JMP1	STRAP	E4
JMP2	STRAP (OPTIONAL)	B7
JMP3	STRAP (OPTIONAL)	A11
OSC1	1Mhz	D8
R2	47K	A7
R3	0K0	A9
R4	12K	A8
R5	0K220	A10
R6	47K	A10
R7	8 x 10K	H2
R9	1K	E4
R11	10K	C5
R12	1K	H5
R13	1K	H6
R14	5K	A10

Name	Type	Pos
R15	100K	A11
R16	2K2	A11
R17	0K0	E8
R18	10K (OPTIONAL)	B7
R19	1K (OPTIONAL)	B8
R20	49K (OPTIONAL)	B7
SW1	DIL-SWITCH	H2
X	DIN C64 MA	H1
Z1	12V	A8
A)	BEMÆRK:	
	HARTING 0903 196 6921	

Name	Type	Pos

Component locations

PCB: **6016K / 12 bit AI** | Issue: 3 | Date: ------

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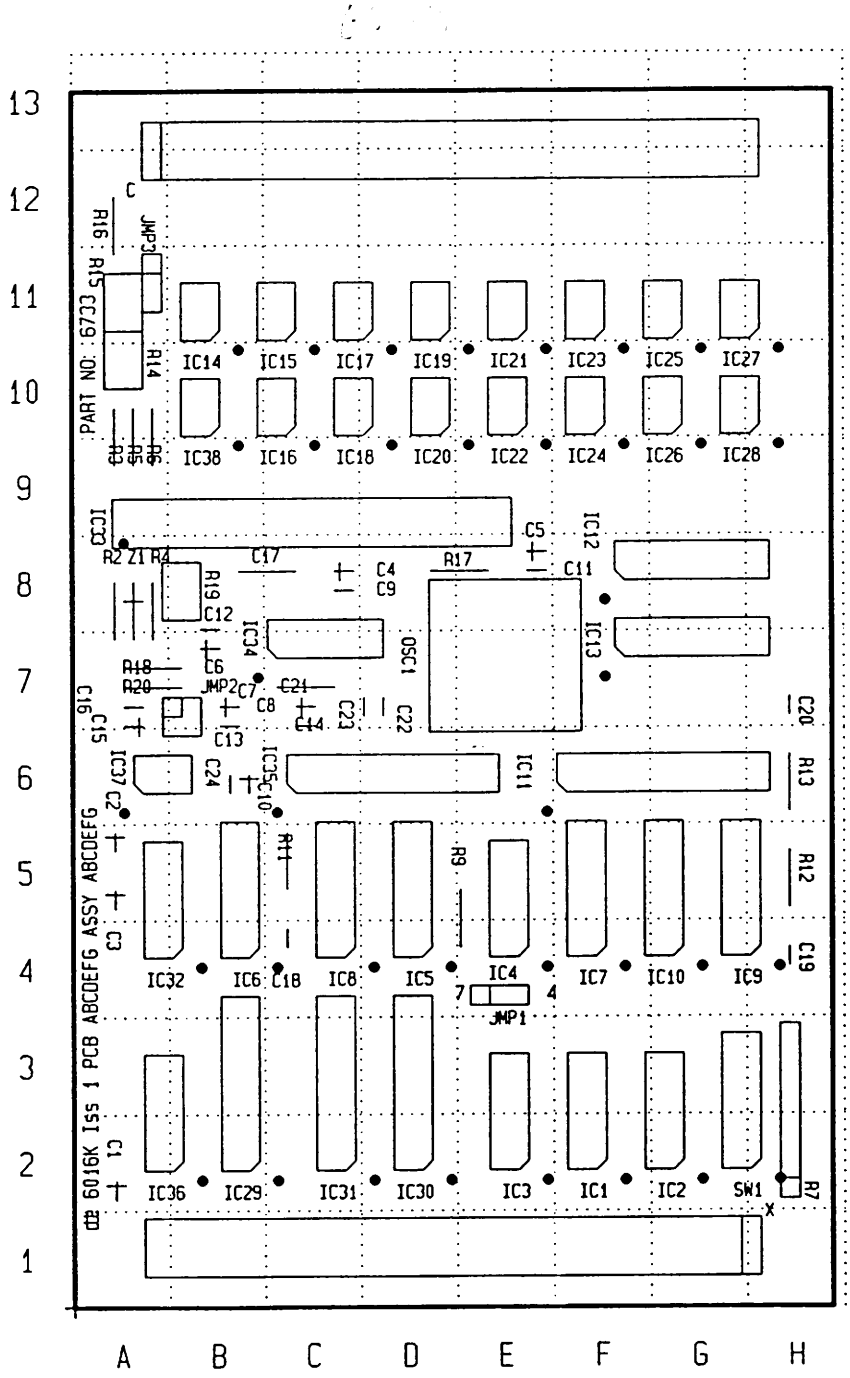


Component locations				
PCB: 6016K / 12 bit AI	Issue: 1	Date: ------	dde	dansk data elektronik a/s herlev hovedgade 199. 2730 herlev. tlf. 02-84 50 11

Manual for

IPC/1 Digital Output Modul

Varenummer 6741

Dansk Data Elektronik A/S
Januar 1989

Ansvarlig: Gilbert E. Jensen

Indholdsfortegnelse

1. Introduktion

IPC/1 modulet type 6741 er et digitalt output kort med 30 kanaler. De 30 output er alle make/slutte kontakter.

Modulets processorside er isoleret fra signalsiden, ligesom de enkelte kanaler er indbyrdes isolerede.

Forbindelsen ud mod brugeren sker med et specielt stik, i hvilket der er monteret lysdioder til indikation af, om de enkelte kanaler er aktive eller ej.

Kortet er forsynet med en 8-polet adresse-switch, og det er muligt at have 64 Digitale Output kort, svarende til 1920 kanaler, i et enkelt IPC/1 system.

Varenummeret dækker over board (varenummer 6741b) samt periferistik (varenummer 6741c).

2. Specifikationer

Antal digitale udgange:	30
Kontakt-princip:	Relæ-kontakter af make/slutte typen for direkte styring af low-power signaler eller til styring af high-power relæer (f.eks. via interface-kort type 6745)
Isolation mellem kanaler:	Min. 400 V
Isolation til processor:	Min. 1500 V
Switch spænding:	Max. 60 VDC, 125 VAC
Switch strøm:	Max. 1 A
Switch effekt:	Max. 30 W, 60VA
Mekanisk levetid:	$5x10^6$ skift
Signal tilslutning:	Via medfølgende stik (varenummer 6741c).

3. Funktionsbeskrivelse

Kortet er opbygget med 30 relæer med enkelte skifte-kontakter af make/slutte-typen og bruges til direkte styring af low-power signaler eller til indirekte styring via high-power relæer f.eks. via interface-kortet type 6745. Til indikation af, om kanalen er sluttet eller ej, er der anbragt lysdioder i serie med driversignalerne til relæspolerne. Lysdioderne er placeret i det medfølgende stik (varenummer 6741c). Ved at sætte lysdioderne i serie med spolesignalet sikres en bedre kontrolfunktion, end hvis de havde været sat i parallel.

Ved system-reset eller power-up vil alle relæer være åbne (logisk nul). Dette gælder også ved fald i 5 Volt forsyningen.

Kortet er et IPC type 6 kort (typen er programmeret på kortet).

Med 4 OUT-instruktioner er det muligt at sætte de digitale udgange, 8 udgange ad gangen (se skema 3-1). Med 4 IN-instruktioner er det muligt at læse relæstillingerne tilbage til CPU'en, 8 udgange ad gangen. Bit 6 og 7 i datafeltet i instruktionen IN(4n+3) er altid 0 (altid lav), idet de bruges til kontrol af, om kortet er monteret (se skema 3-1)

Bits i datafeltet	7	6	5	4	3	2	1	0
OUT(4n): sæt udgang #	7	6	5	4	3	2	1	0
OUT(4n+1): sæt udgang #	15	14	13	12	11	10	9	8
OUT(4n+2): sæt udgang #	23	22	21	20	19	18	17	16
OUT(4n+3): sæt udgang #	X	X	29	28	27	26	25	24
IN(4n) : læs udgang #	7	6	5	4	3	2	1	0
IN(4n+1) : læs udgang #	15	14	13	12	11	10	9	8
IN(4n+2) : læs udgang #	23	22	21	20	19	18	17	16
IN(4n+3) : læs udgang #	lav	lav	29	28	27	26	25	24

Skema 3-1

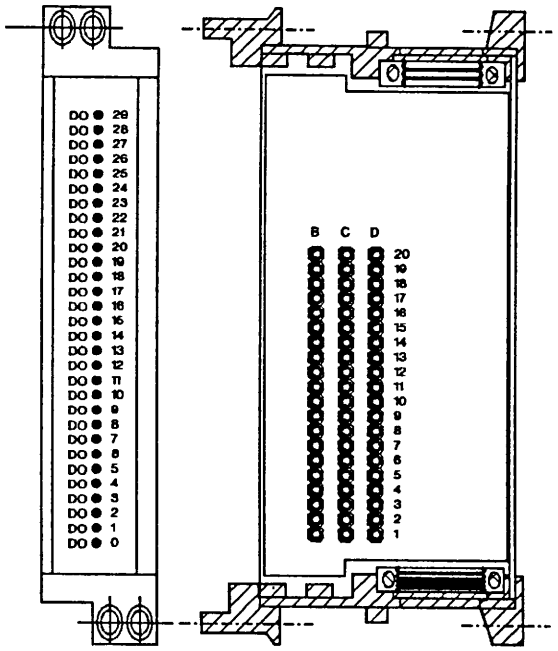
Adresse-switchen SW skal sættes til:

Switch SW:	Digital Output kanal #:
00000000 binært = 0 decimalt	0 - 29
00000100 binært = 4 decimalt	30 - 59
00001000 binært = 8 decimalt	60 - 89
XXXXXX00 binært = 4n decimalt	(30n) - (30n+29), n = 0,1,...,63

4. Mekanisk beskrivelse af board og stik

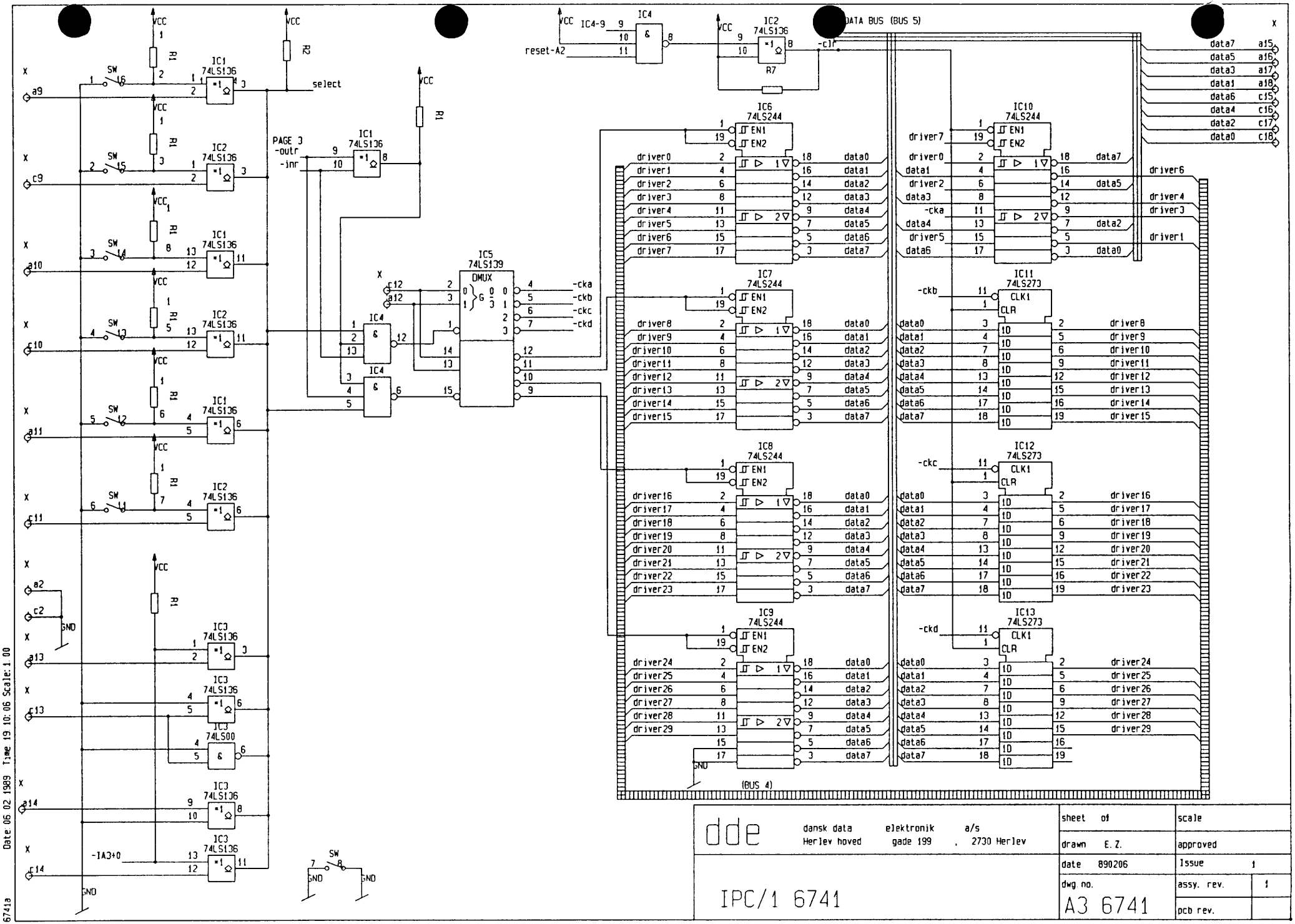
IPC/1 modulet 6741 består af et board (standard europakort format) samt et periferistik med indbyggede lysdioder. Boardet er afsluttet i en 96-polet DIN-konnektor påmonteret en aluminiums forplade, der muliggør dels fastspænding i IPC/1 rack, dels fastspænding af periferistikket.

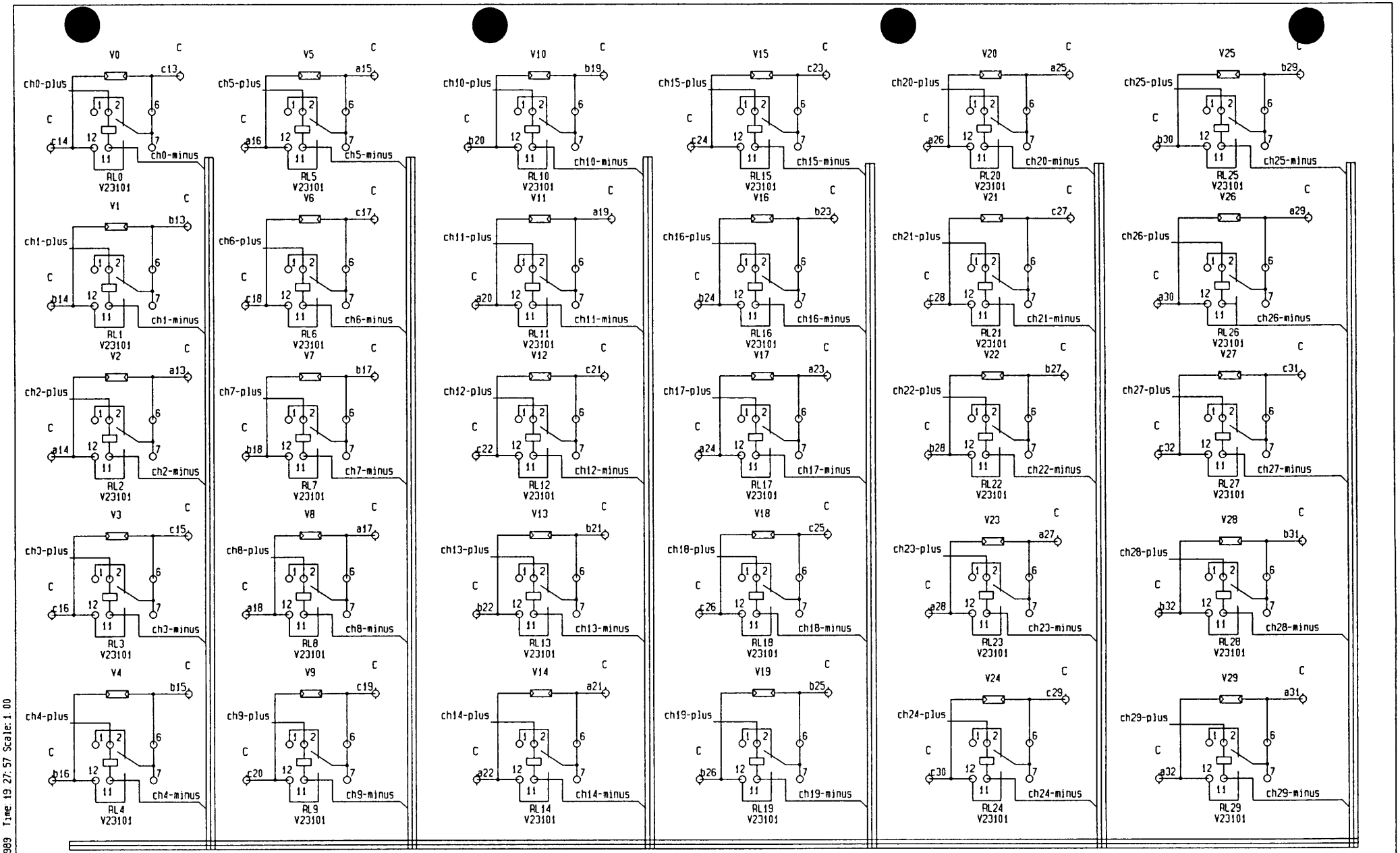
Signal tilslutningen sker via det medfølgende stik (varenummer 6741c) forsynet med loddeterminaler:



Connection:

Channel #:	Name:	Channel #:	Name:
0 (in)	B 20	15 (in)	B 10
0 (out)	B 19	15 (out)	B 9
1 (in)	C 20	16 (in)	C 10
1 (out)	C 19	16 (out)	C 9
2 (in)	D 20	17 (in)	D 10
2 (out)	D 19	17 (out)	D 9
3 (in)	B 18	18 (in)	B 8
3 (out)	B 17	18 (out)	B 7
4 (in)	C 18	19 (in)	C 8
4 (out)	C 17	19 (out)	C 7
5 (in)	D 18	20 (in)	D 8
5 (out)	D 17	20 (out)	D 7
6 (in)	B 16	21 (in)	B 6
6 (out)	B 15	21 (out)	B 5
7 (in)	C 16	22 (in)	C 6
7 (out)	C 15	22 (out)	C 5
8 (in)	D 16	23 (in)	D 6
8 (out)	D 15	23 (out)	D 5
9 (in)	B 14	24 (in)	B 4
9 (out)	B 13	24 (out)	B 3
10 (in)	C 14	25 (in)	C 4
10 (out	C 13	25 (out)	C 3
11 (in)	D 14	26 (in)	D 4
11 (out)	D 13	26 (out)	D 3
12 (in)	B 12	27 (in)	B 2
12 (out)	B 11	27 (out)	B 1
13 (in)	C 12	28 (in)	C 2
13 (out)	C 11	28 (out)	C 1
14 (in)	D 12	29 (in)	D 2
14 (out)	D 11	29 (out)	D 1


DATA BUS (BUS 5)
IC4
IC4-9
reset-A2
IC2
74LS136
R7
-clr
IC6
74LS244
IC7
74LS244
IC8
74LS244
IC9
74LS244
IC10
74LS244
IC11
74LS273
IC12
74LS273
IC13
74LS273
IC5
74LS139
DMUX
PAGE 3
-outr
-inr
select
R1
R2
VCC
GND
SW
-cka
-ckb
-ckc
-ckd
driver0
driver1
driver2
driver3
driver4
driver5
driver6
driver7
driver8
driver9
driver10
driver11
driver12
driver13
driver14
driver15
driver16
driver17
driver18
driver19
driver20
driver21
driver22
driver23
driver24
driver25
driver26
driver27
driver28
driver29
data0
data1
data2
data3
data4
data5
data6
data7
(BUS 4)
-IA3+0
dde
dansk data elektronik a/s
Herlev hoved gade 199 , 2730 Herlev
IPC/1 6741
A3 6741
sheet of
drawn E. Z.
date 890206
dwg. no.
scale
approved
Issue 1
assy. rev. 1
pcb rev.
Date: 06 02 1989 Time: 19 10:06 Scale: 1.00
6741a



6741b Date 06 02 1989 Time 19 27 57 Scale: 1.00

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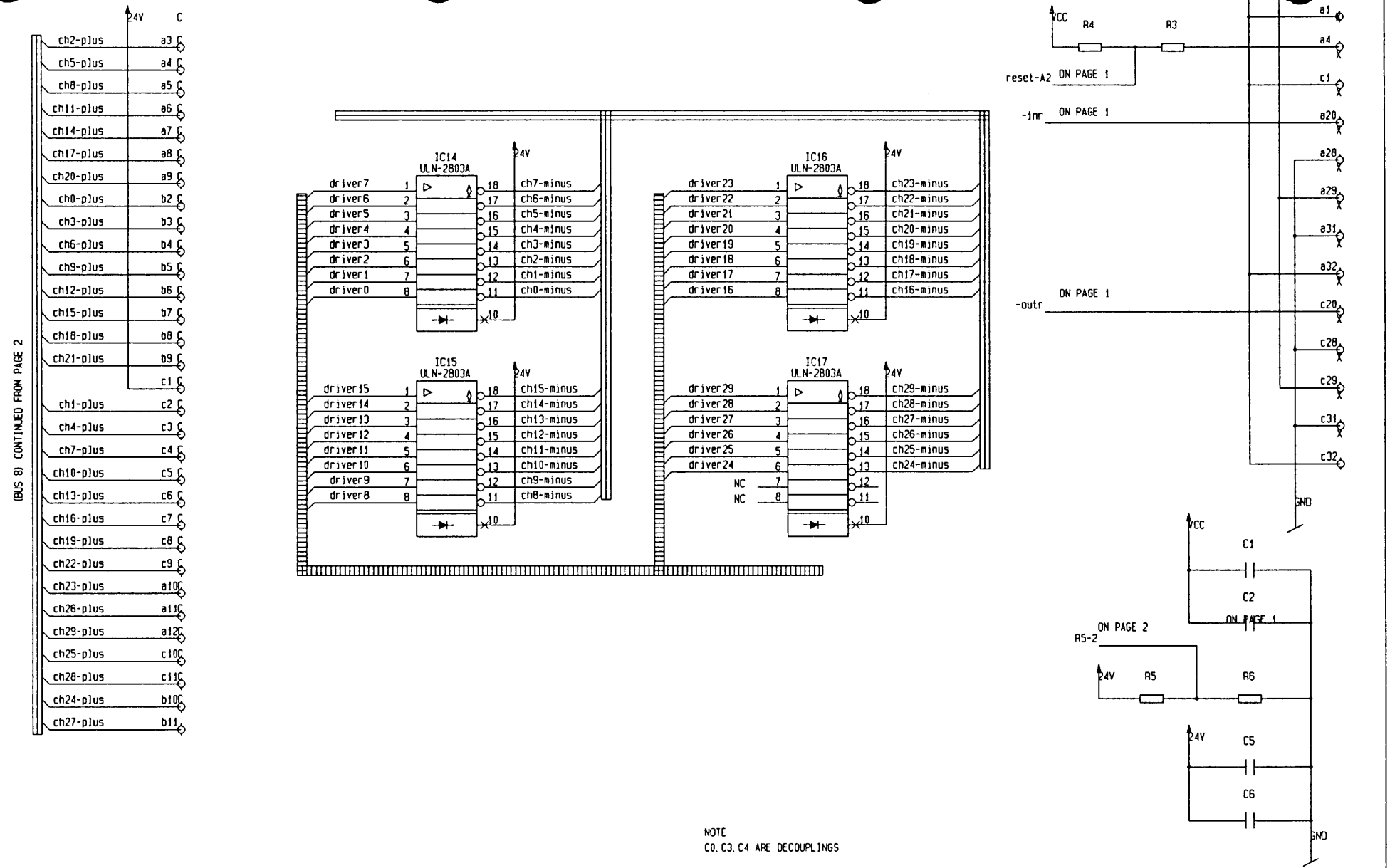
Herlev hoved gade 199 . 2730 Herlev

IPC/1 6741

sheet 02	scale
drawn E. Z.	approved
date 890206	Issue 1
dwg. no. A3 6741	assy. rev. 1
	pcb rev.



dde dansk data elektronik a/s Herlev hoved gade 199 . 2730 Herlev	sheet 03	scale	
	drawn E. Z.	approved	
	date 890206	Issue 1	
IPC/1 6741	dwg. no. A3 6741	assy. rev.	1
		pcb rev.	

6741c Date 06 02 1989 Time 19 35 42 Scale: 1 00

Varenummer:	6711
Nyt varenummer:	
Klokkerholms interne nummer:	
Varetekst:	IPC/1 basissystem
Består af:	**Kortmagasin (varenummer 6000t)** **Strømforsyning (varenummer 6000b)** CPU-modul **(varenummer 6000c)** * Forplade type: 6000c * Strapsetting: Jumper 1: 1->4 (1 waitstate) - 2: NC - 3: 1->7 (4800 baud) - 4: 2->1 (26 ms int.) - 5: 2->3 (deaktiv. TRAP) Lager-modul **(varenummer 6001)** * Forplade type: 6001 * Dekoder PROM: 8x8K * RAM/PROM bestykning: S0: SPS 1/3 S1: SPS 2/3 S2: SPS 3/3 S3-S7: RAM 8K f.x. HM6264P-10 Kabel **(varenummer 88803050)**

Varenummer:	6000b	
Nyt varenummer:		
Klokkerholms interne nummer:		
Varetekst:	IPC/1 strømforsyning, 220 VAC, 170 W	
Består af:	Print type: 6000b Iss. 1 Kassette type: Kassette forplade: Strømforsyning type 1: Strømforsyning type 2:	

Varenummer:	6012	
Nyt varenummer:		
Klokkerholms interne nummer:		
Varetekst:	IPC/1 DUART kommunikations modul	
Består af:	Print type: 6012 Forplade type: 6012	

Varenummer:	6721
Nyt varenummer:	
Klokkerholms interne nummer:	
Varetekst:	IPC/1 DI modul
Består af:	Print type: 6027 s-1 Forplade type: 6721 Label type: Mekoprint h0015 Stik type: 6721c

Varenummer:	6721c
Nyt varenummer:	
Klokkerholms interne nummer:	
Varetekst:	Stik til 6721
Består af:	Print type: 6027c Iss. 1 Hus type: Harting 09 06 048 0521 09 06 000 9984 Indsats: røgfarvet plexiglasplade Label type: Mekoprint h0015

Varenummer:	6732
Nyt varenummer:	
Klokkerholms interne nummer:	
Varetekst:	IPC/1 AI-MUX modul
Består af:	Print type: 6019 Iss. 4 Forplade type: 6732o Label type: Mekoprint h0014 Stik type: 6732c

Varenummer:	6732c
Nyt varenummer:	
Klokkerholms interne nummer:	
Varetekst:	Stik til 6732
Består af:	Print type: 6019c Iss. 1 Hus type: Harting 09 06 048 0521 09 06 000 9984 Indsats: røgfarvet plexiglasplade Label type: Mekoprint h0014

Varenummer:	6733
Nyt varenummer:	
Klokkerholms interne nummer:	
Varetekst:	IPC/1 AI modul
Består af:	Print type: 6016K Iss. 1 Forplade type: 6733 Label type: Mekoprint h0013 Stik type: 6733c

Varenummer:	6733c
Nyt varenummer:	
Klokkerholms interne nummer:	
Varetekst:	Stik til 6733
Består af:	Print type: 6016c Iss. 1 Hus type: Harting 09 06 048 0521 09 06 000 9984 Indsats: røgfarvet plexiglasplade Label type: Mekoprint h0013

Varenummer:	6741
Nyt varenummer:	
Klokkerholms interne nummer:	
Varetekst:	IPC/1 DO modul
Består af:	Print type: 6026 Iss. 3 Forplade type: 6741 Label type: Mekoprint h0016 Stik type: 6741c

Varenummer:	6741c
Nyt varenummer:	
Klokkerholms interne nummer:	
Varetekst:	Stik til 6741
Består af:	Print type: 6026c Iss. 1 Hus type: Harting 09 06 048 0521 09 06 000 9984 Indsats: røgfarvet plexiglasplade Label type: Mekoprint h0016

Varenummer:	6751	
Nyt varenummer:		
Klokkerholms interne nummer:		
Varetekst:	IPC/1 AO modul	
Består af:	Print type: ~~6751~~ Iss. 1 6017 Forplade type: 6751 Label type: Stik type: 6751c	

Varenummer:	6751c	
Nyt varenummer:		
Klokkerholms interne nummer:		
Varetekst:	Stik til 6751	
Består af:	Print type: 6027c Iss. 1 Hus type: Harting 09 06 048 0521 09 06 000 9984 Indsats: røgfarvet plexiglasplade Label type:	