TITLE

CT PULSE TRANSFORMER CARD
ENGINEERING SPEC & TEST INSTRUCTION

FIRST MADE FOR 193X389AAG01, G02

REVISIONS

1.0 SCOPE

The following covers the performance capabilities and test instructions for the 193X389AAG01 Pulse Transformer card. This card is designed to be a standard part of the AFTROL II Inverter. This card is a 6-channel for firing 6 isolated SCRs with each channel performing the following functions:

1.01 Provides voltage isolation between the input and output signals.

1.02 Provide current amplification of the output signal from the input signal.

1.03 Operates satisfactorily with a wide range of output loading, including open or shorted output, for either single pulse or pulse train operation.

1.04 Operates with minimum time delay between input and output signals, and produces a fast rise time output.

1.05 Contains pulse transformer reset control.

1.06 Contains an input filter and threshold to suppress input signal transients.

1.07 Contains a rectifier plus select resistors for commutating current feedback.

1.08 The G02 card contains CF resistor for 100kVA, 460V only.

2.0 PERFORMANCE CAPABILITIES

All cards should be capable of the following performance while exposed to the conditions of section 4.0.

2.01 Inputs/Outputs (1-6 channels)

+20/COM	- Power Supply input +20 volts/COMMON
1P,1M,2P,2N,3P,3N	- Signam input (+15 volts, 10 ma)
CT1, CT2	- COMM CURRENT input from CT
1PG,1NG,2PG,2NG,3PG,3NG	- Firing output to SCR gate
1PC,1NC,2PC,2NC,3PC,3NC	- Firing output to cathode
CF	- COMM CURRENT signal output

2.02 Voltage Isolation

Rated voltage between input and output of each channel, and between outputs of the two channels, is 600 volts a.c. rms. Isolation capacitance between input and output is less than 35 pf.

2.03 Output Current and Voltage

There are two normal input signals for this card. The first is a single 10usec. wide, 15V magnitude, 0.1usec. rise time pulse input. The second is the same pulse in a pulse train, with 32usec. between pulses, and the pulse train being on for a max. of half the time. The output current & voltage magnitudes for the 2 input signals above are given in Table 1 for three output load conditions.

1 Add 1.08; add G02 Re-typed 5/25/83

AW(BW)

5B(8)M

5D(CD)

5E(A&S)

5P(1)BW

5R(2)BW

PRINTS TO

Table 1

Load Resistance	Output Current Range: Single or Initial Pulse	Output Current Range: Pulse Train Operation	Output Voltage Range: Single or Initial Pulse	Output Voltage Range: Pulse Train Operation
10 ohms (Avg.SCR Gate resistance)	0.70 to 1.10 amps	0.60 to 1.00 amps	7.0 to 11.0 volts	6.0 to 10.0 volts
0 ohms (output shorted)	1.62 to 2.07 amps	1.29 to 1.65 amps	0	0
ohms (output open)	0	0	14.3 to 16.1 volts	13.7 to 15.5 volts

2.04 Time Delays and Rise Time

For a 15 volt, 0.1usec. rise time, 10usec. wide input pulse, the output voltage and D42C7 collector voltage are shown in Fig. 1. The turn-on or up delay time shown will vary from 0.4 to 1.2usec. The output pulse rise time will be less than 0.5usec. The turn-off or down delay time will vary from 0.5 to 2.0usec., mainly dependent on temperature.

2.05 Pulse Transformer Reset and Saturation

After the output pulse disappears, the pulse transformer is reset through the 13V zener diode which limits the actual transformer reset voltage to 13 to 16V. This voltage adds to the filtered +20V applied to the card channel such that the D42C7 transistor is subjected to a reset voltage, as shown in Fig. 1, of from 30 to 36V, depending on output load. The reset time will vary from 6 to 20usec. depending on output voltage and pulse width.

The wave shapes in Fig. 1 are dependent on the pulse transformer not saturating during the output pulse. No saturation will occur if the product of the output voltage and pulse width time is less than 130 volt-usec.

2.06 Input Threshold

A combination of input threshold and time constant prevents input electrical noise transients from causing an output pulse. For input pulse magnitudes of less than 3.2 volts, no output pulse will occur. The input must be greater than 6.0 volts before any output can be assured, and must be greater than 10 volts before a full output pulse can be obtained.

For a 15 volt input pulse of less than 0.4usec. in duration, no output pulse will occur. The input pulse width must be greater than 1usec. before any output can be assured.

REVISIONS

1	9/26/80	HOL Chg Table 1 Add G02, Re-type 5/25/83

AW(BW)
5B(8)M
5D(CD)
5E(A&S)
5P(1)BW
5P(2)BW
PRINTS TO

REV NO. 1

224X432AA

CONT ON SHEET 4 SH NO. 3

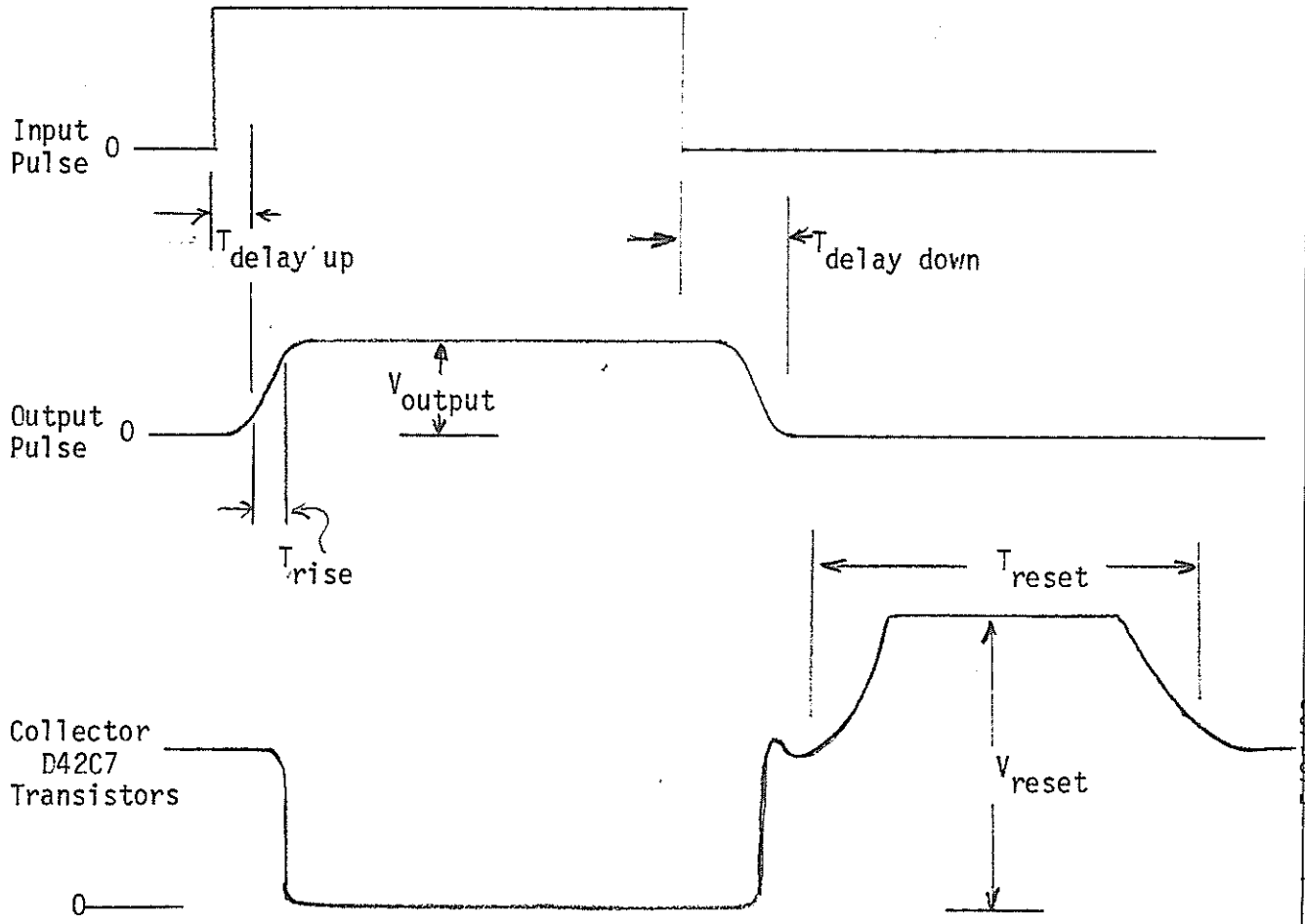
TITLE

CT PULSE TRANSFORMER CARD
ENGINEERING SPEC & TEST INSTRUCTION

FIRST MADE FOR 193X389AAG01, G02

REVISIONS

Figure 1



1 Add G02; re-type 5/25/83

AW(BW)

5B(8)M

5D(CD)

5E(A&S)

5P(1)BW

5R(2)BW

PRINTS TO

MADE BY H.O.Loberg 10/11/79

ISSUED Re-typed 5/25/83

APPROVALS

SVPO DIV OR DEPT.

Erie, PA LOCATION

224X432AA

CONT ON SHEET SH NO.

2.07 Circuit Protection

This card will not be damaged from open circuiting or short circuiting the output for up to 10 minutes, with a normal puylse train input as specified in Sect. 2.03. This card will not be damaged by applying a continuous input signal for up to 1 minute.

2.08 This card contains a rectifier and select resistors for commutation current feedback.

The signal from the commutation current transformer is spplied to connectors CT1 & CT2. The output voltage at CF is reduced to about 72% when CT1 is negative. The signal relationships are:

G02		G01, Voltage-kVA Resistor Selection			
H100		L60	L30/H60	L15/H30	H15
730	Peak comm. current, amps	905	421	200	110
10.0	Peak CF voltage, CT1 pos.	10.0	10.0	10.0	10.0
7.1	Peak CF voltage, CT1 neg.	7.2	7.2	7.3	7.2

3.0 TEST INSTRUCTIONS

Connect a regulated 20 volt power supply capable of furnishing up to 1 amp to the +20 to COM. Connect a 10 ohjm, 1%, 5W loading resistor across the output terminals 1PG through 3NC. Connect a signal source to input terminals 1P through 3N to COM depending on the channel being tested. This signal should be a pulse train, each pulse being 10usec. wide and 15V in magnitude above common, with a rise time of .lusec.,. and with 75usec. between each pulse in the pulse train. This signal source should be capable of being loaded up to 10 ma.

3.01 Voltage Isolation

This card should be able to withstand a hipot of 2500V for 1 minute between the output terminals and common.

3.02 Output Current and Voltage

The output current for the 10 ohm loading should be from 0.60 to 1.00 amps as indicated by the 6.0 and 10.0 volts magnitude of the output pulse across the 10 ohm resistor.

If the output load is a 1 ohm resistor, the output current should increase to between 1.25 to 1.6 amps. (1.25 to 1.6 output volts)

If the output is open circuited, the output voltage should increase to between 14.0 to 15.8 volts.

3.03 Time Delays and Rise Time

For the 10 ohm output loading, the input and output pulses should appear as shown in Fig. 1. The delay and rise times should be as follows:

a) T delay up = 0.4 to 1.2 usec.
b) T rise = 0.5 usec.
c) T delay down = 0.5 to 2.0 usec.

REVISIONS

1	Change 3.02 9/26/80	HOL
2	Add G02; re-Type 5/25/83	

AW(BW)
5B(8)M
5D(CD)
5E(A&S)
5P(1)BW
5R(2)BW

PRINTS TO

3.04 Pulse Transformer Reset and Saturation

The D42C7 transistor collector (top hat sink tab) voltage should exhibit a wave shape as shown in Fig. 1. The reset voltage and time should be as follows:

a) V reset = 31 to 35 volts
b) T reset = 6 to 10 usec.

Increase the input signal pulse width beyond the 10usec. time, until the pulse transformer begins to saturate. Saturation occurs when the output pulse goes down while the input pulse is still high. Saturation should not occur until the pulse width has been increased beyond 15 to 20usec., depending on the output voltage. In all cases the product of the output voltage and pulse width should exceed 130 volt-usec.

3.05 Input Threshold

Decrease the input signal pulse width below the 10usec. time, until the output pulse disappears. The input pulse should still be at least 0.4 usec. wide.

Increase the input signal pulse width back to 10usec. Now decrease the input pulse magnitude below 15 volts, until the output pulse disappears. The input pulse should still be at least 3.2 volts high.

3.06 Input + 100mA DC Signal from CT1 to CT2.
Output voltage on CF should be -

Signal Conn.	G01				G02
	L60	L30/H60	L15/H30	H15	H100
Output w/CT1 pos: max.	2.3	5.0	10.5	19.1	2.9
min.	2.1	4.5	9.5	17.3	2.6
Output w/CT1 neg: max.	1.7	3.6	7.7	13.8	2.1
min.	1.5	3.2	6.9	12.5	1.8

4.0 OPERATING and TEST CONDITIONS

This card should be capable of operating within the performance specified in Sec. 2.0 and passing all tests specified in Sec. 3.0 while exposed to the following conditions:

4.01 Power Supply Voltage - +19.8 to 20.2 volts from +20A, B to COM.

4.02 Ambient Temperature - 0 to +75°C

4.03 Humidity - 24 hrs. in 90% relative humidity at 40°C

4.04 Voltage Between Circuits or to Ground -
600 volts from input circuits to ground
1000 volts from input to output circuits
1000 volts between output circuits
1000 volts from output circuits to ground

REVISIONS

1	Add G02; re-type 5/25/83
AW(BW)	
5B(8)M	
5D(CD)	
5E(A&S)	
5P(1)BW	
5P(2)BW	
PRINTS TO	