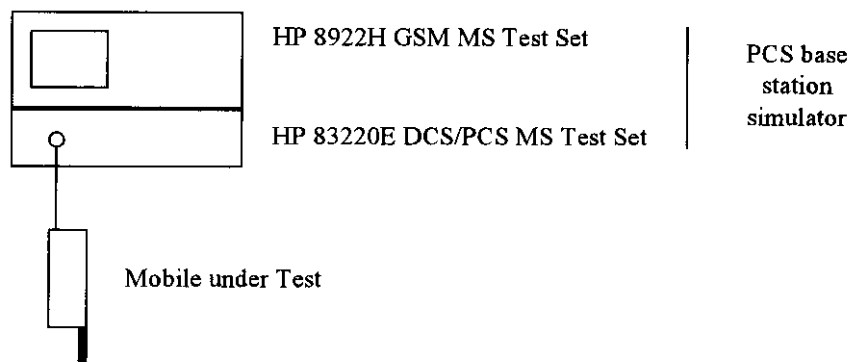


### **3. TYPE ACCEPTANCE REQUIRED MEASUREMENTS AND RESULTS.**

### 3.1. MEASUREMENTS REQUIRED. RF POWER OUTPUT.

The RF output peak power is measured on the RF connector of the mobile.



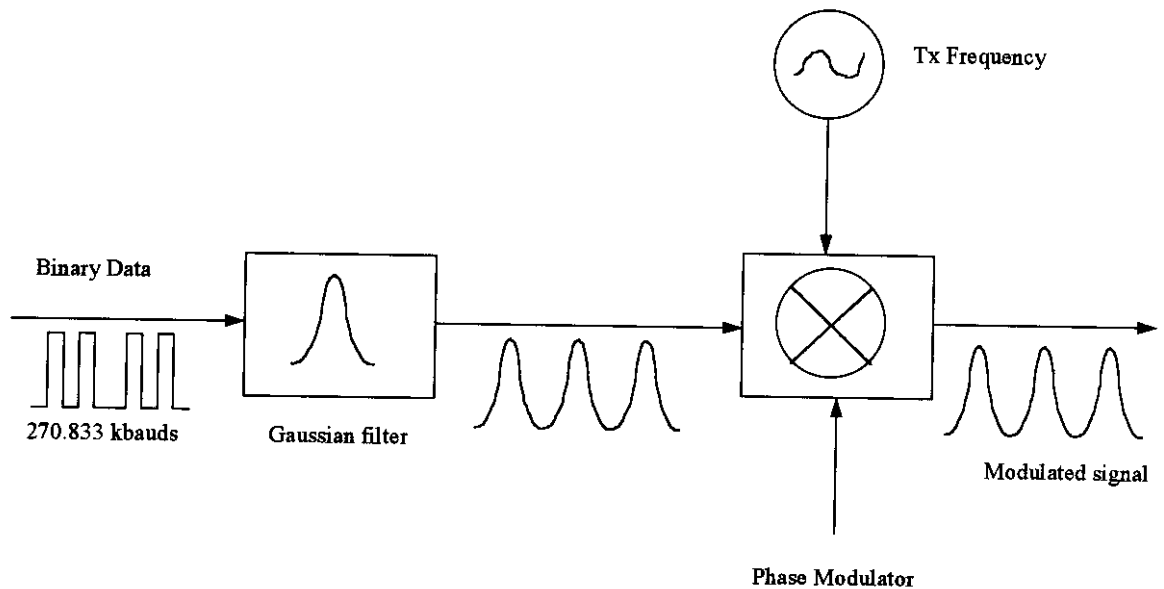
| Power Control Level |     |        | Channel 512 |        | Channel 661 |        | Channel 810 |        |
|---------------------|-----|--------|-------------|--------|-------------|--------|-------------|--------|
| Tx Level            |     |        | 1850.2 MHz  |        | 1880.0 MHz  |        | 1909.8 MHz  |        |
|                     | dBm | W      | dBm         | W      | dBm         | W      | dBm         | W      |
| P0                  | 30  | 1.0000 | 29.4        | 0.8710 | 29.8        | 0.9550 | 29.7        | 0.9333 |
| P1                  | 28  | 0.6310 | 27.8        | 0.6026 | 28.0        | 0.6310 | 27.8        | 0.6026 |
| P2                  | 26  | 0.3981 | 25.7        | 0.3715 | 26.0        | 0.3981 | 26.1        | 0.4074 |
| P3                  | 24  | 0.2512 | 23.7        | 0.2344 | 24.0        | 0.2512 | 24.2        | 0.2630 |
| P4                  | 22  | 0.1585 | 21.6        | 0.1445 | 21.9        | 0.1549 | 22.1        | 0.1622 |
| P5                  | 20  | 0.1000 | 19.6        | 0.0912 | 19.9        | 0.0977 | 20.1        | 0.1023 |
| P6                  | 18  | 0.0631 | 17.5        | 0.0562 | 17.8        | 0.0603 | 18.0        | 0.0631 |
| P7                  | 16  | 0.0398 | 15.3        | 0.0339 | 15.7        | 0.0372 | 15.9        | 0.0389 |
| P8                  | 14  | 0.0251 | 13.4        | 0.0219 | 13.8        | 0.0240 | 14.0        | 0.0251 |
| P9                  | 12  | 0.0158 | 11.2        | 0.0132 | 11.6        | 0.0145 | 11.7        | 0.0148 |
| P10                 | 10  | 0.0100 | 9.2         | 0.0083 | 9.6         | 0.0091 | 9.8         | 0.0095 |
| P11                 | 8   | 0.0063 | 7.4         | 0.0055 | 7.8         | 0.0060 | 8.0         | 0.0063 |
| P12                 | 6   | 0.0040 | 5.2         | 0.0033 | 5.6         | 0.0036 | 5.8         | 0.0038 |
| P13                 | 4   | 0.0025 | 2.4         | 0.0017 | 2.8         | 0.0019 | 2.9         | 0.0019 |
| P14                 | 2   | 0.0016 | 1.1         | 0.0013 | 1.6         | 0.0014 | 1.7         | 0.0015 |
| P15                 | 0   | 0.0010 | -0.3        | 0.0009 | 0.1         | 0.0010 | 0.3         | 0.0011 |

### 3.2. MEASUREMENTS REQUIRED. MODULATION CHARACTERISTICS.

The modulation used for PCS 1900, the North American version of the GSM standard is a digital type modulation.

The speech is digitised and coded. The binary rate is 270.833 kbauds.

The PCS 1900 modulation scheme is a "constant envelope" modulation scheme, named GMSK (Gaussian Minimum Shift Keying) where data only affects the signal phase, not the frequency.



### 3.3. MEASUREMENTS REQUIRED. OCCUPIED BANDWIDTH.

When the mobile is in transmitter mode, the occupied bandwidth corresponds to the GMSK modulation with the following characteristics :

- Modulation : Gaussian Minimum Shift Keying, with  $B.T = 0.3$ .
- ( $B$  = Bandwidth of the Gaussian Filter).
- ( $T$  = 1 bit duration).
- Modulation rate : 270.833 kbit/s.
- Constant envelope (only the phase is changed by the data).
- GMSK modulation spectrum.

| Frequency offset from the carrier             | 100 kHz | 200 kHz | 250 kHz | 400 kHz | 600 kHz |
|-----------------------------------------------|---------|---------|---------|---------|---------|
| Attenuation in dB (referenced to the carrier) | +0.5 dB | -30 dB  | -33 dB  | -60 dB  | -60 dB  |

(Attenuation is given with a measurement bandwidth of 30 kHz).

Measurements of the GMSK modulation spectrum for the channel corresponding to the different blocks follow (modulation characteristics with pseudo random bit sequence PRBS input).

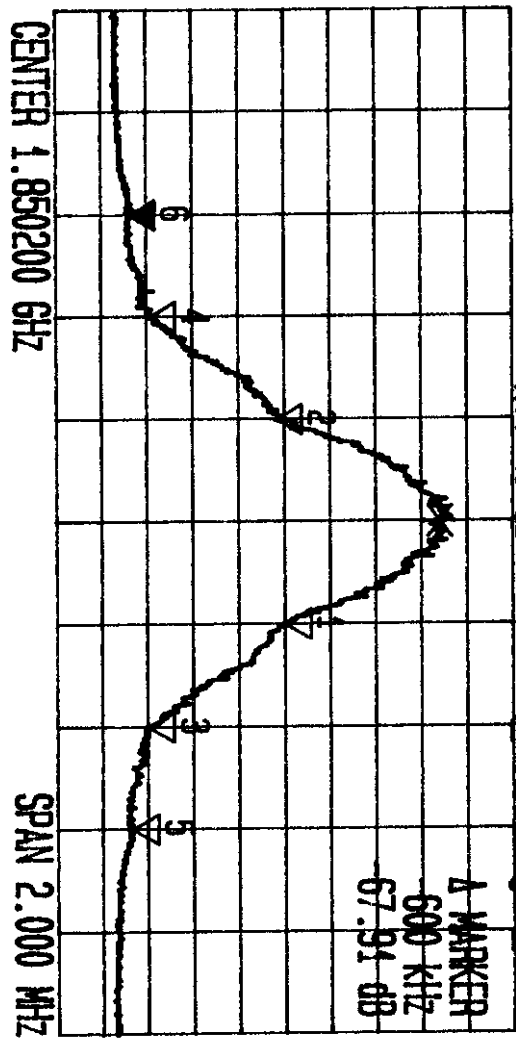
REF 30.0 dBm  
10dB/  
AG 50/50

CENTER  
1.850200 GHz

RBW 30 kHz  
VBW 30 kHz  
SMP 50 MS

ATT 40 dB

Wed Apr 15 15:52:14 1998  
A WriteSav B Blank



\*\*\* Multi Marker List \*\*\*

|       |              |           |   |
|-------|--------------|-----------|---|
| NO.1: | 200 KHZ      | -33.94 dB | A |
| NO.2: | -200 KHZ     | -36.03 dB | A |
| NO.3: | 400 KHZ      | -63.97 dB | A |
| NO.4: | -400 KHZ     | -63.50 dB | A |
| NO.5: | 600 KHZ      | -67.38 dB | A |
| NO.6: | -600 KHZ     | -67.91 dB | A |
| NO.7: |              |           |   |
| NO.8: |              |           |   |
| A:    | 1.850200 GHz | 14.06 dBm | A |

GMsk Modulation Spec  
Channel 512  
f = 1850.2 MHz

Wed Apr 15 17:47:37 1998

REF 31.0 dBm

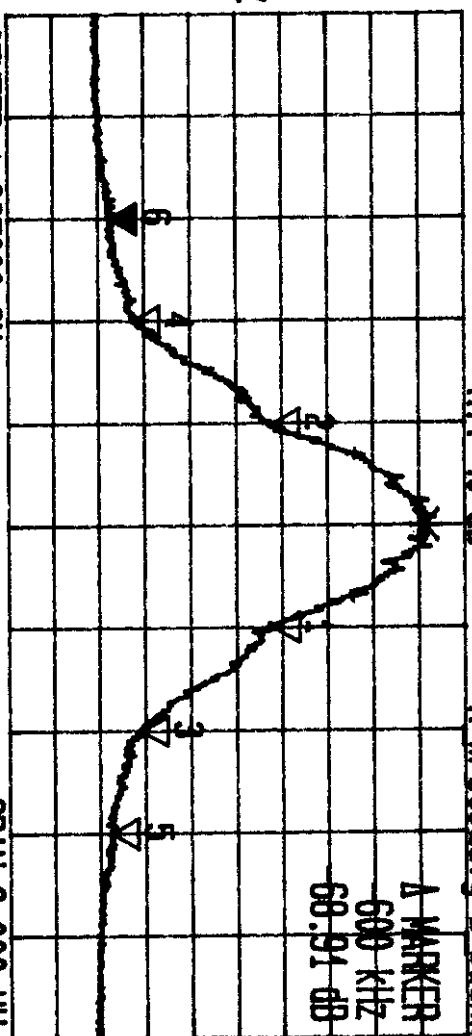
ATT 40 dB

A WriteAvg B blank

10dB/  
AG 50/50

CENTER

1.865000 GHz



RBW 30 kHz  
VBW 30 kHz  
SMP 50 MS

CENTER 1.865000 GHz

\*\*\* Multi Marker List \*\*\*

|       |              |           |   |
|-------|--------------|-----------|---|
| NO.1: | 200 KHz      | -33.22 dB | A |
| NO.2: | -200 KHz     | -33.16 dB | A |
| NO.3: | 400 KHz      | -62.19 dB | A |
| NO.4: | -400 KHz     | -63.56 dB | A |
| NO.5: | 600 KHz      | -68.72 dB | A |
| NO.6: | -600 KHz     | -68.91 dB | A |
| NO.7: |              |           |   |
| NO.8: |              |           |   |
| A:    | 1.865000 GHz | 22.50 dBm | A |

GMSK Modulation Spec  
Channel 586  
 $f = 1865 \text{ MHz}$

REF 31.0 dBm

10dB/

AG 39/50

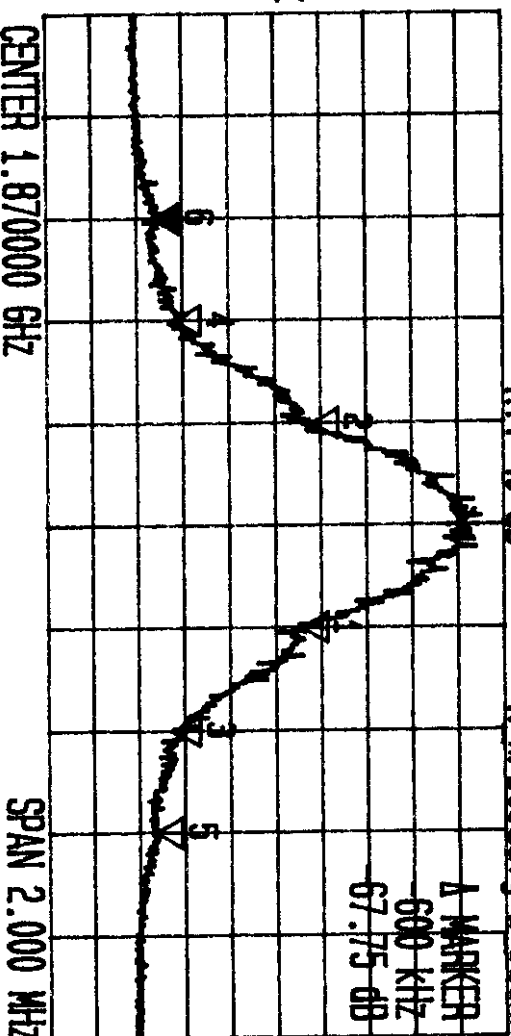
CENTER

1.870000 GHz

RBW 30 kHz  
VBW 30 kHz  
SMP 50 ms

ATT 40 dB

Wed Apr 15 17:53:34 1998  
A writeavg B blank



\*\*\* Multi Marker List \*\*\*

| No. | 1:        | 2:        | 3:        | 4:        | 5:        | 6:        | 7: | 8: |
|-----|-----------|-----------|-----------|-----------|-----------|-----------|----|----|
|     | 200 KHz   | -200 KHz  | 400 KHz   | -400 KHz  | 600 KHz   | -600 KHz  |    |    |
|     | -35.47 dB | -33.13 dB | -63.47 dB | -62.91 dB | -67.56 dB | -67.75 dB |    |    |
|     | A         | A         | A         | A         | A         | A         |    |    |

1.870000 GHz 22.38 dBm A

GMSK Modulation Spect  
channel 611  
f = 1870 MHz

Wed Apr 15 15:58:57 1998

A writeavg B blank

**7 MARKEN**

68.56 dB

## GMSK Modulation Spectra

Channel 66A

$$f = 1880 \text{ MHz}$$

1 MARKER  
600 kHz  
60.56 dB

SPAN 2.000 MHz

CENTRED 1.980000 GHz

**SPAN 2.000 MHz**

1st \*\*\*

200 KHZ  
-200 KHZ  
400 KHZ  
-400 KHZ  
600 KHZ  
-600 KHZ

-34.69 dB  
-39.66 dB  
-63.13 dB  
-62.75 dB  
-67.94 dB  
-68.56 dB

14.59 dBm

A

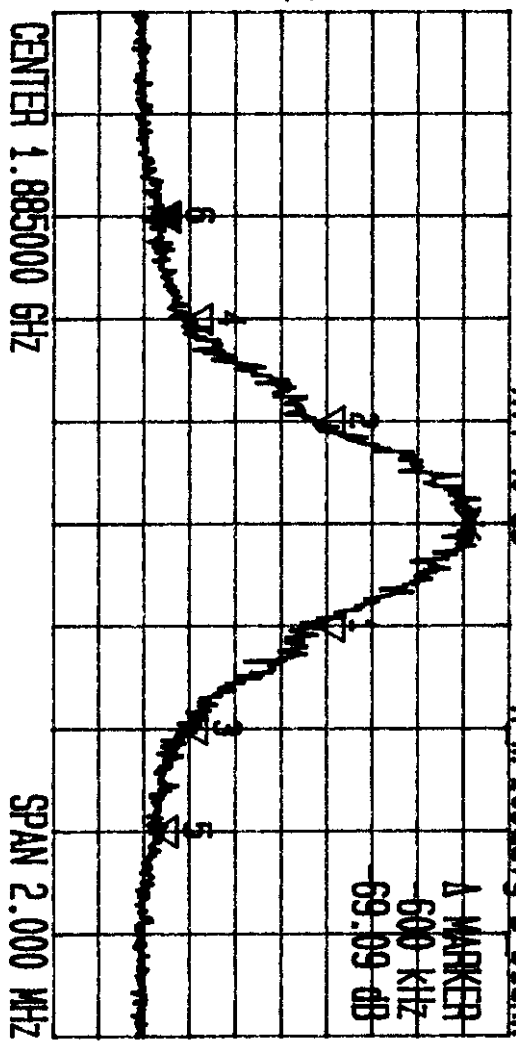
REF 31.0 dBm  
10dB/  
AG 8/50

CENTER  
1.885000 GHz

RBW 30 kHz  
VBW 30 kHz  
SMP 50 MS

ATT 40 dB

Med Apr 15 17:56:52 1998  
A writeSavg B blank



GMSK Modulation Sp  
Channel 686  
f = 1885 MHz

\*\*\* Multi Marker List \*\*\*

|       |              |           |   |
|-------|--------------|-----------|---|
| NO.1: | 200 KHZ      | -33.09 dB | A |
| NO.2: | -200 KHZ     | -33.00 dB | A |
| NO.3: | 400 KHZ      | -63.00 dB | A |
| NO.4: | -400 KHZ     | -61.78 dB | A |
| NO.5: | 600 KHZ      | -69.25 dB | A |
| NO.6: | -600 KHZ     | -69.09 dB | A |
| NO.7: |              |           |   |
| NO.8: |              |           |   |
| A:    | 1.885000 GHz | 22.19 dBm | A |

Wed Apr 15 18:04:26 1998

REF 31.0 dBm

10dB/

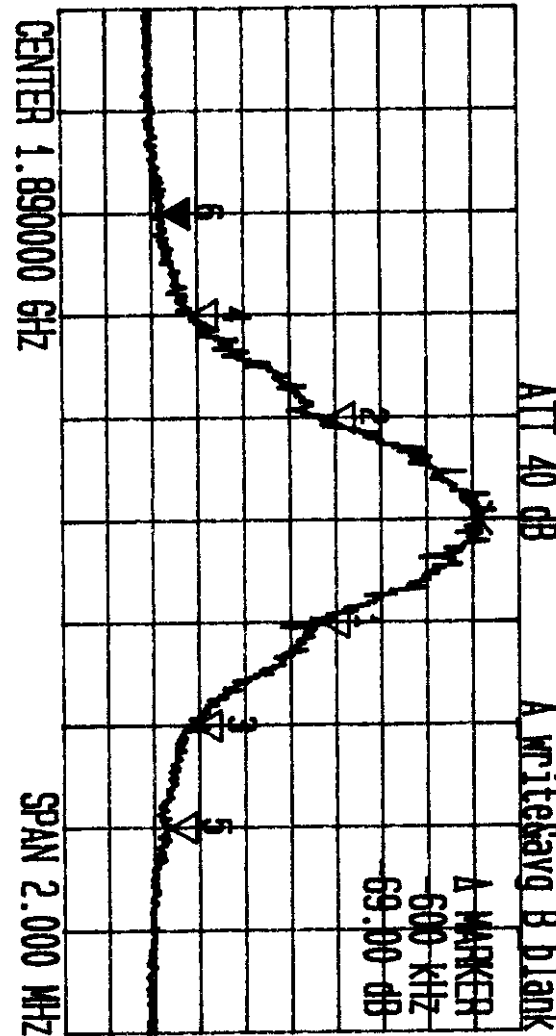
AG 22/50

CENTER

1.890000 GHz

RBW 30 KHz  
VBW 30 KHz  
SMP 50 MS

SPAN 2.000 MHz



GMSK Modulation Spec  
channel #11  
f = 1890 MHz

\*\*\* Multi Marker List \*\*\*

|       |              |           |   |
|-------|--------------|-----------|---|
| No.1: | 200 KHz      | -34.91 dB | A |
| No.2: | -200 KHz     | -33.25 dB | A |
| No.3: | 400 KHz      | -62.84 dB | A |
| No.4: | -400 KHz     | -63.38 dB | A |
| No.5: | 600 KHz      | -68.41 dB | A |
| No.6: | -600 KHz     | -69.00 dB | A |
| No.7: |              |           |   |
| No.8: |              |           |   |
| A:    | 1.890000 GHz | 22.97 dBm | A |

Med Apr 15 18:11:04 1998

ATT 40 dB

A WriteSav B blank

REF 31.0 dBm

10dB/

AG 19/50

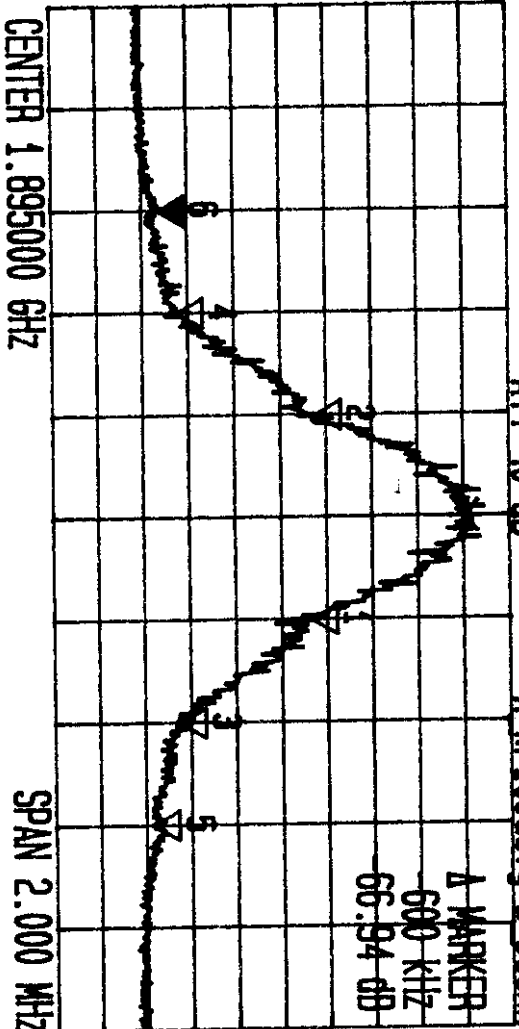
CENTER

1.895000 GHz

RBW 30 KHz

VBW 30 KHz

SMP 50 ms



GMSK Modulation Spec  
Channel 736  
f ~ 1895 MHz

NO.1:  
NO.2:  
NO.3:  
NO.4:  
NO.5:  
NO.6:  
NO.7:  
NO.8:  
A:

1.895000 GHz 21.81 dBm A

REF 30.0 dBm

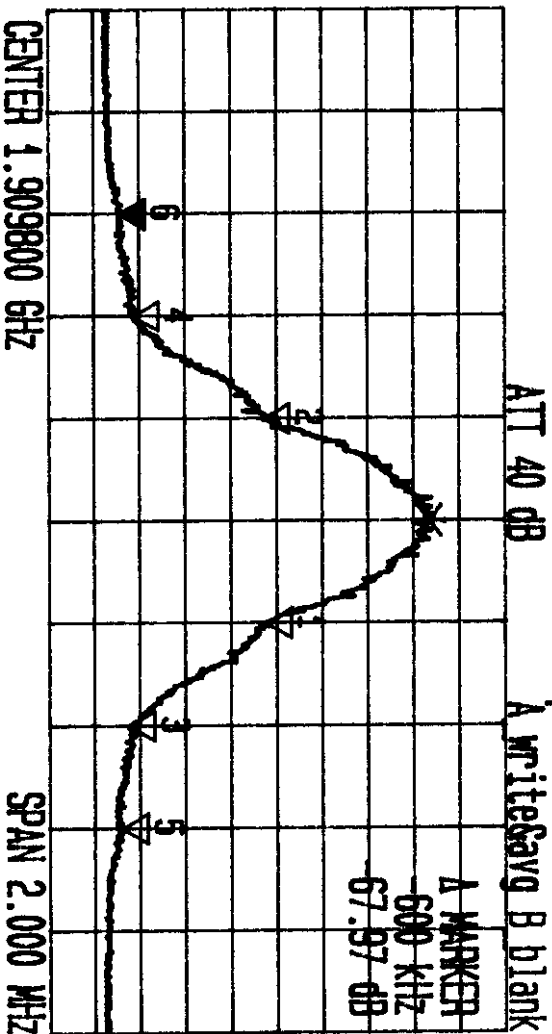
10dB/

AG 50/50

CENTER

1.909800 GHz

RBW 30 KHz  
VBW 30 KHz  
SMP 50 MS



GMSK Modulation Spect

channel 810

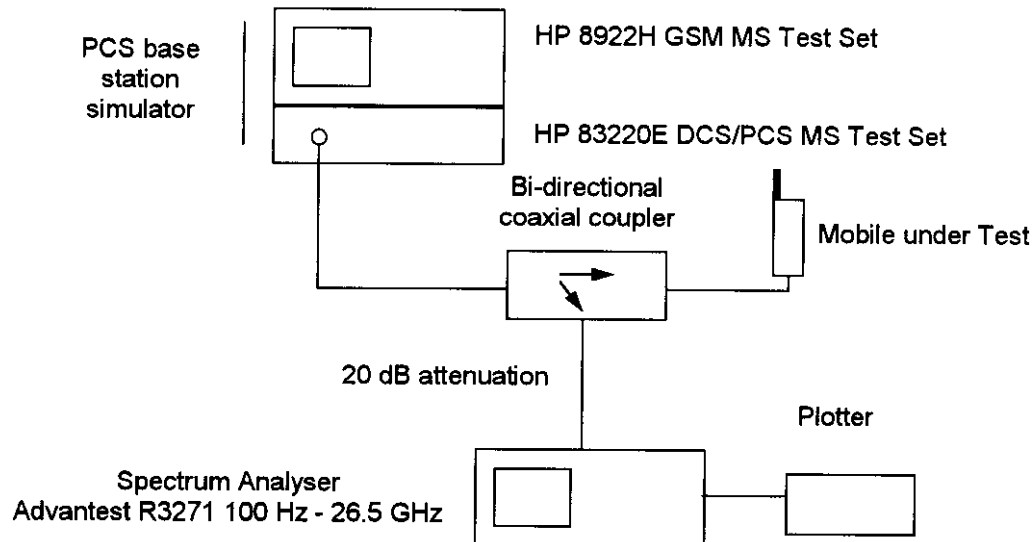
f = 1909.8 MHz

\*\*\* Multi Marker List \*\*\*

|       |              |           |   |
|-------|--------------|-----------|---|
| NO.1: | 200 KHz      | -36.09 dB | A |
| NO.2: | -200 KHz     | -36.84 dB | A |
| NO.3: | 400 KHz      | -66.09 dB | A |
| NO.4: | -400 KHz     | -65.03 dB | A |
| NO.5: | 600 KHz      | -67.84 dB | A |
| NO.6: | -600 KHz     | -67.97 dB | A |
| NO.7: |              |           |   |
| NO.8: |              |           |   |
| A:    | 1.909800 GHz | 13.91 dBm | A |

### 3.4. MEASUREMENTS REQUIRED. SPURIOUS EMISSIONS AT ANTENNA TERMINALS.

Spurious emissions are measured on the RF connector of the mobile. The radiotelephone is in communication mode. Spurious emissions are measured by a spectrum analyser connected to the mobile as shown on the figure.



The spectrum is measured in "Maxhold" mode on the analyser, between 100 MHz to 10 GHz and for the three following channels:

- Channel 512 corresponds to 1850.2 MHz in emission.
- Channel 661 corresponds to 1880.0 MHz in emission.
- Channel 810 corresponds to 1909.8 MHz in emission.

According to FCC part 24.238, the power of any emission shall be attenuated below the transmitted power (1 W) by at least  $43 + 10 \log P = 43 + 10 \log 1 = 43$  dB.

So, the limit is 43 dB attenuated compared to 1 W.

$$1 \text{ W} = 30 \text{ dBm}$$

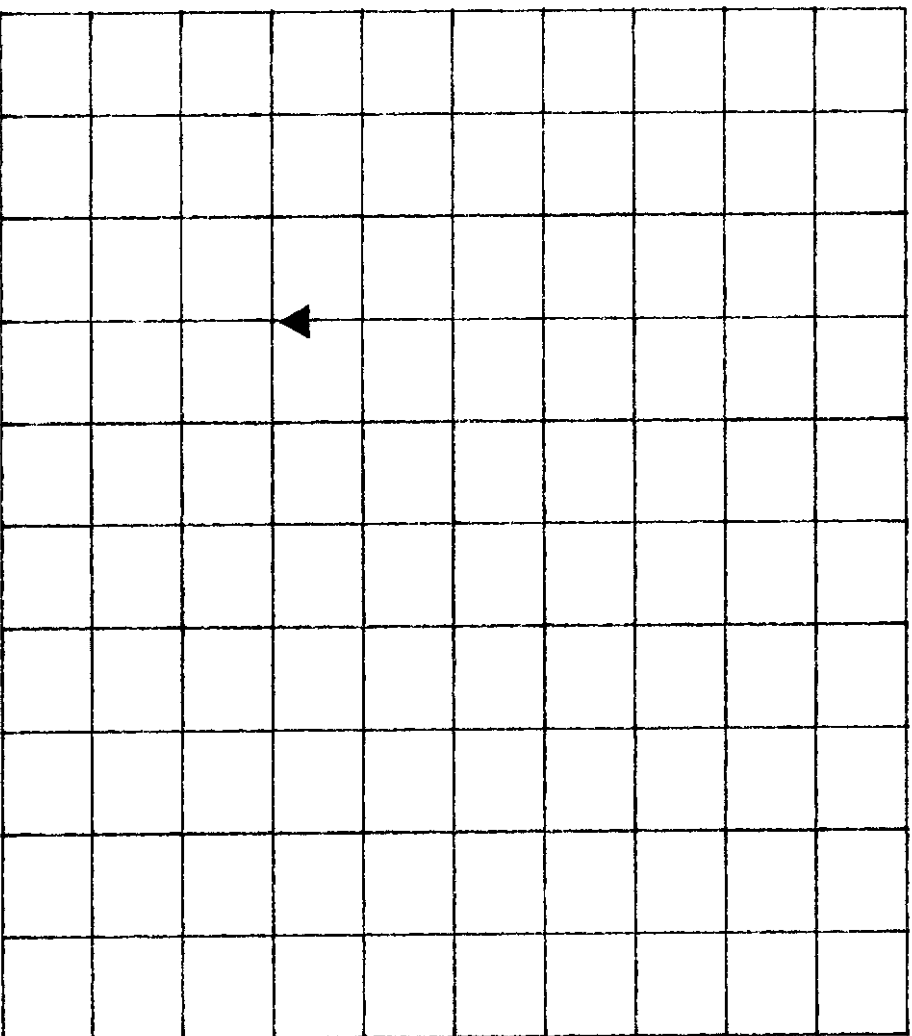
The maximum power level of the spurious are  $30 \text{ dBm} - 43 \text{ dBm} = -13 \text{ dBm}$  or 0.05 mW.

This limit is reported on each graph by a dotted line.

### 3.5. MEASUREMENTS REQUIRED. FIELD STRENGTH OF SPURIOUS RADIATION.

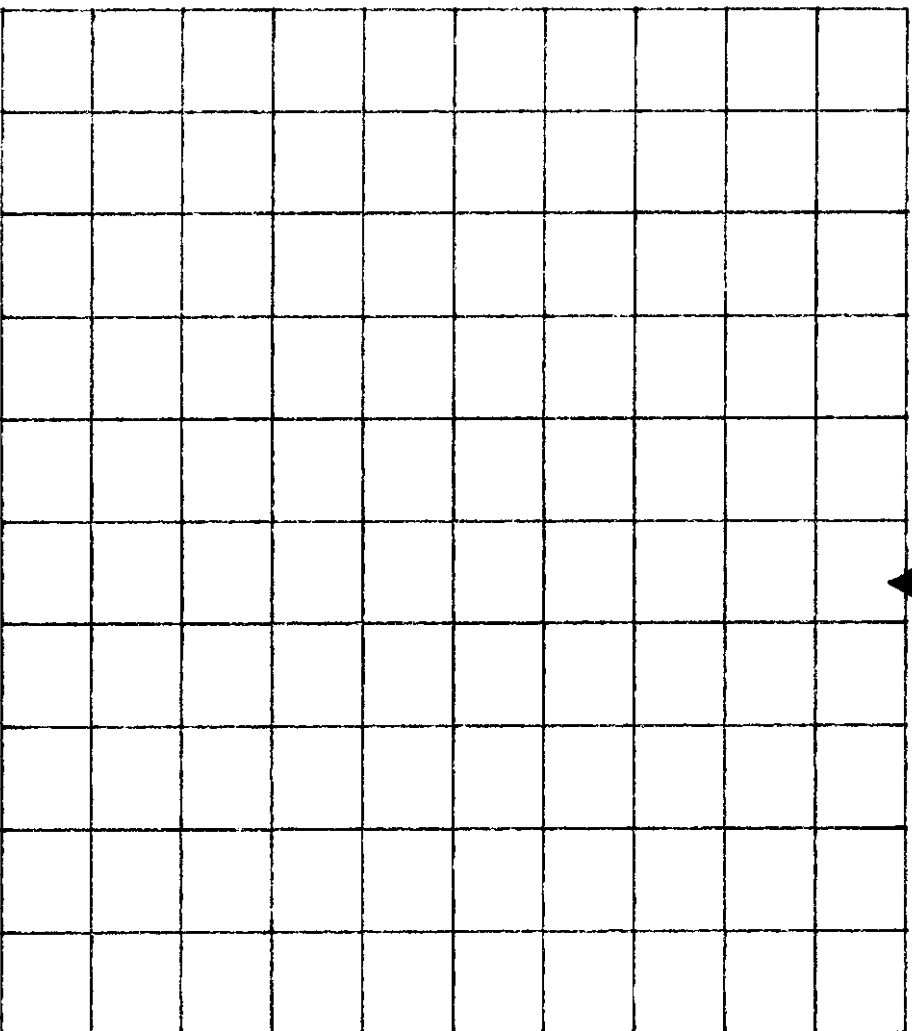
See measurement results in section 6.1.

B\_blank



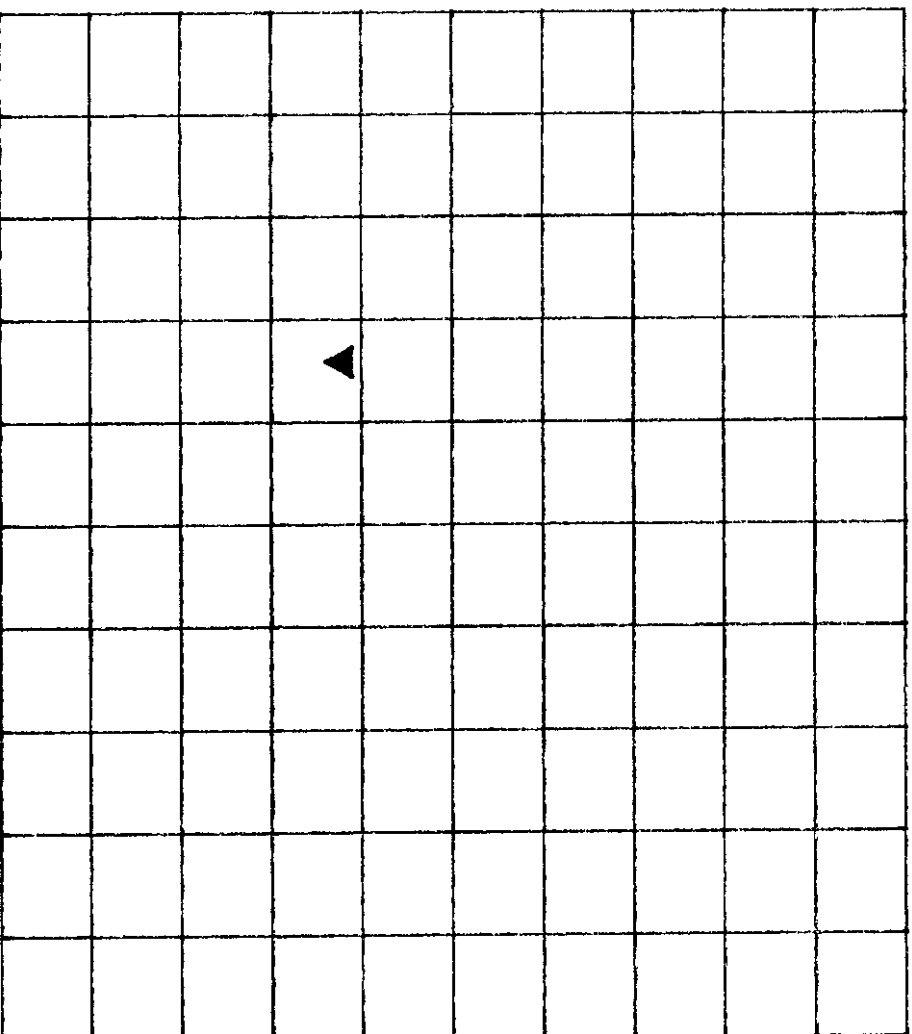
Channel 512

B\_blank



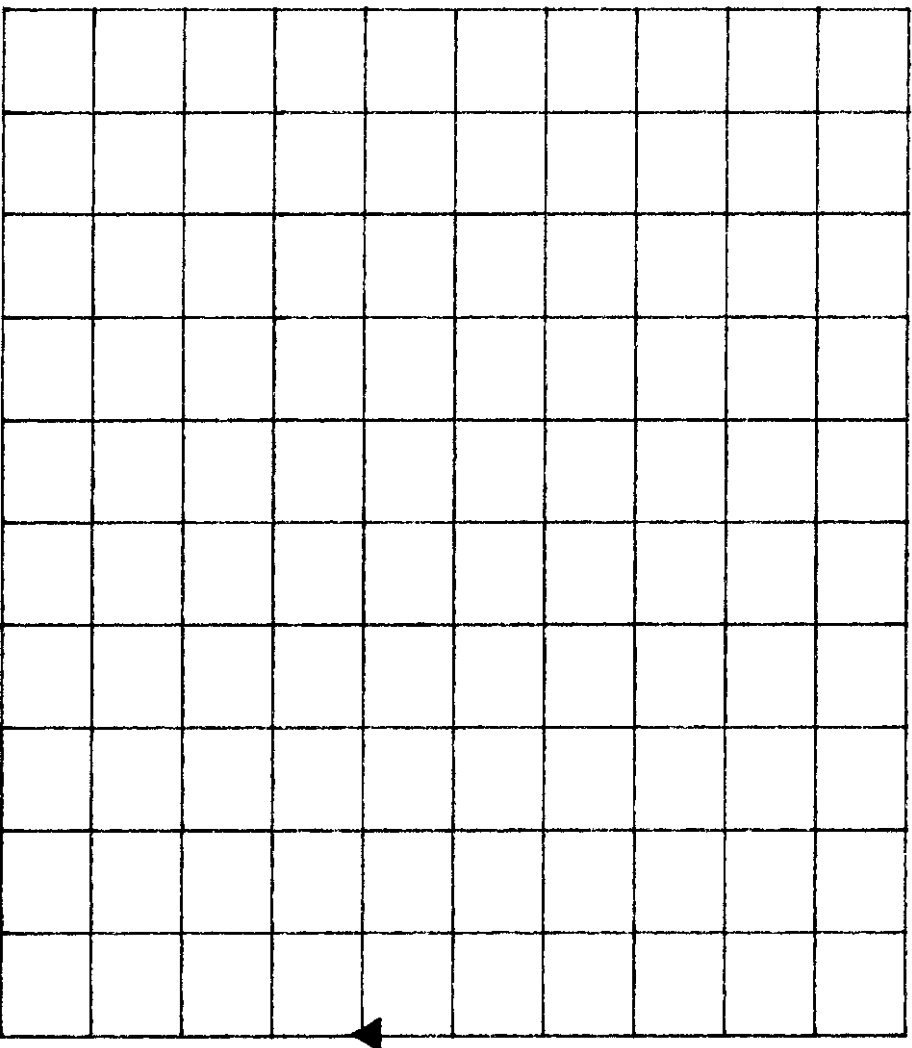
Channel 512

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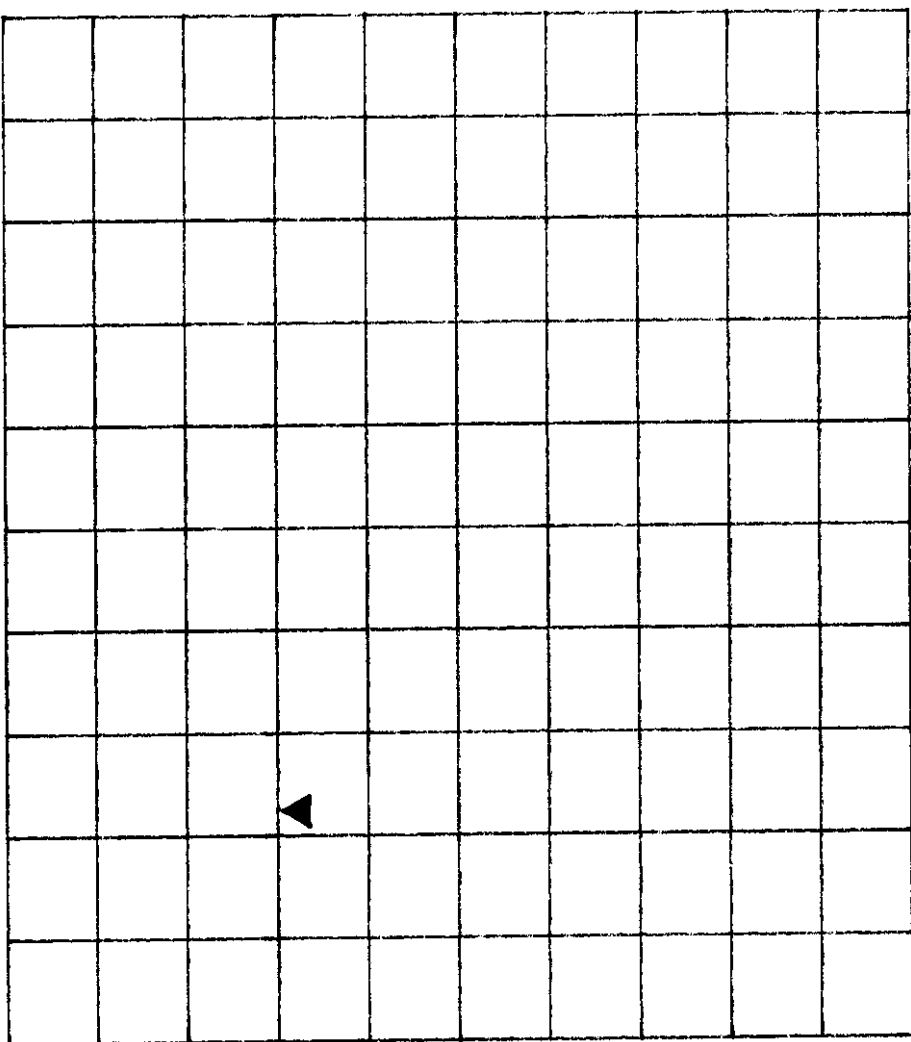
Channel 512

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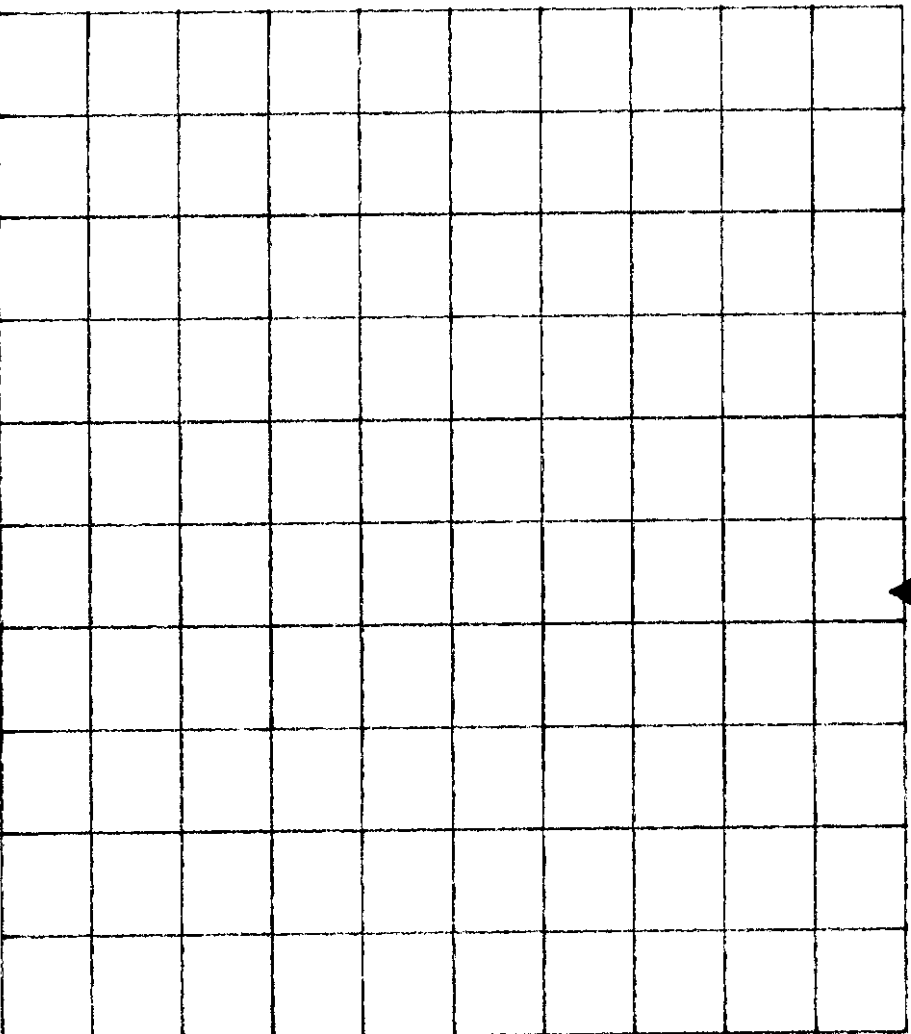
Channel S12

B\_blank



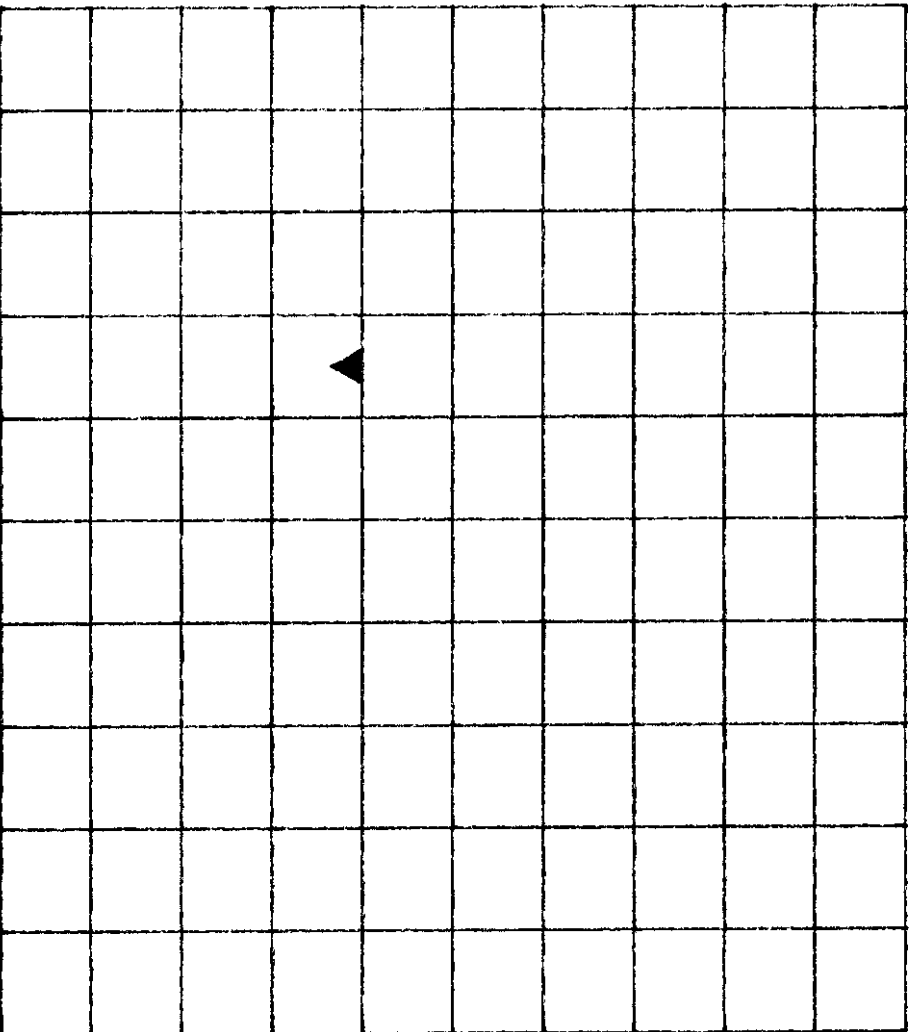
Channel 586

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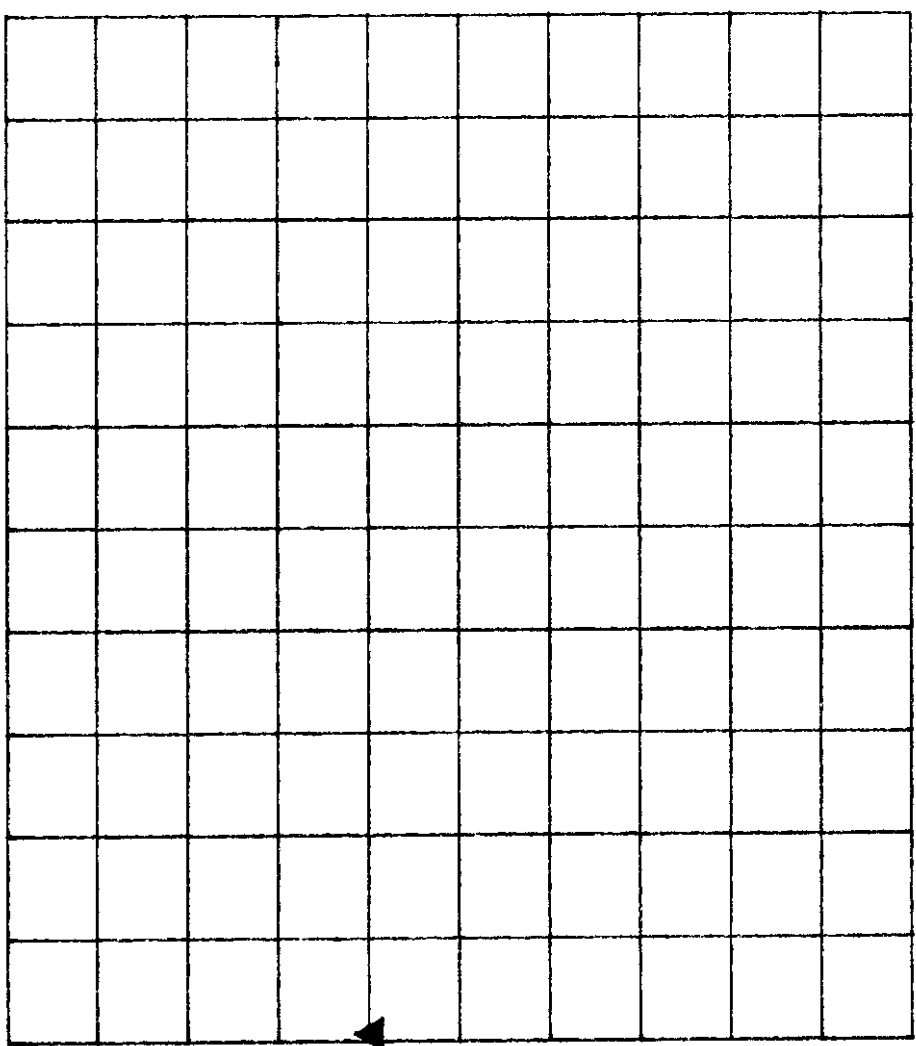
Channel 586

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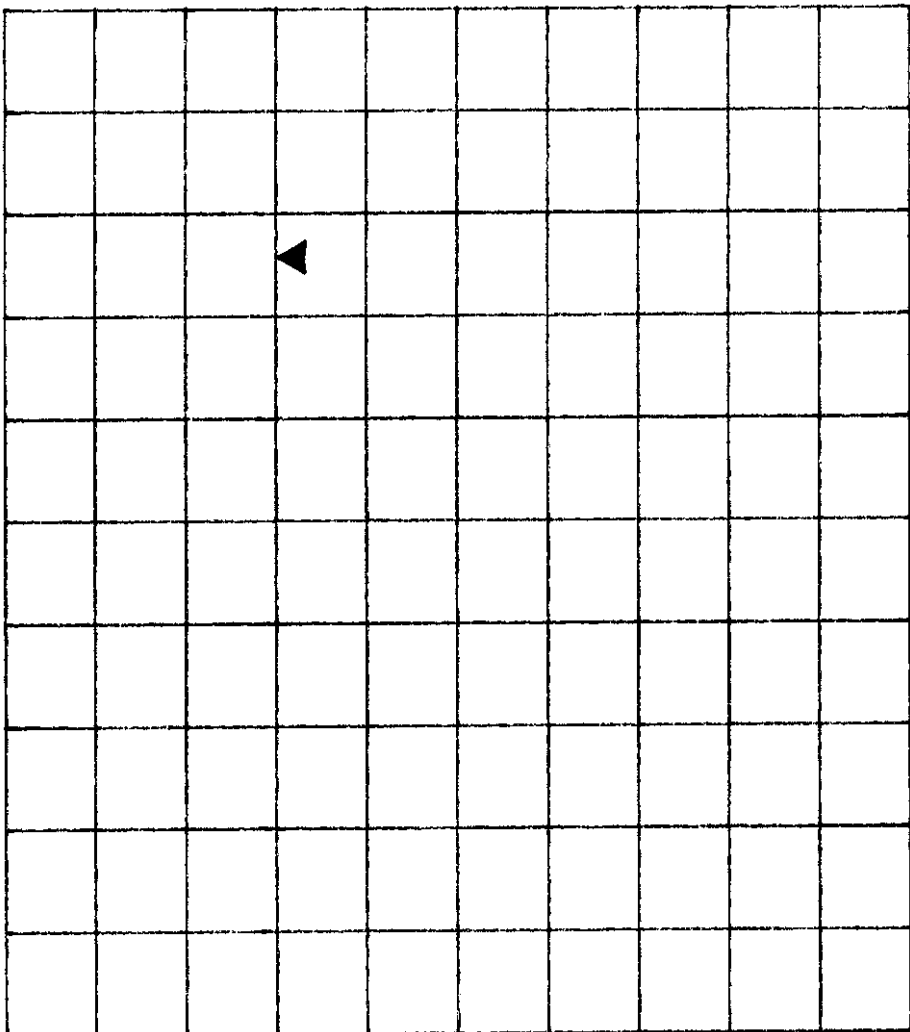
Channel 586

B\_blank



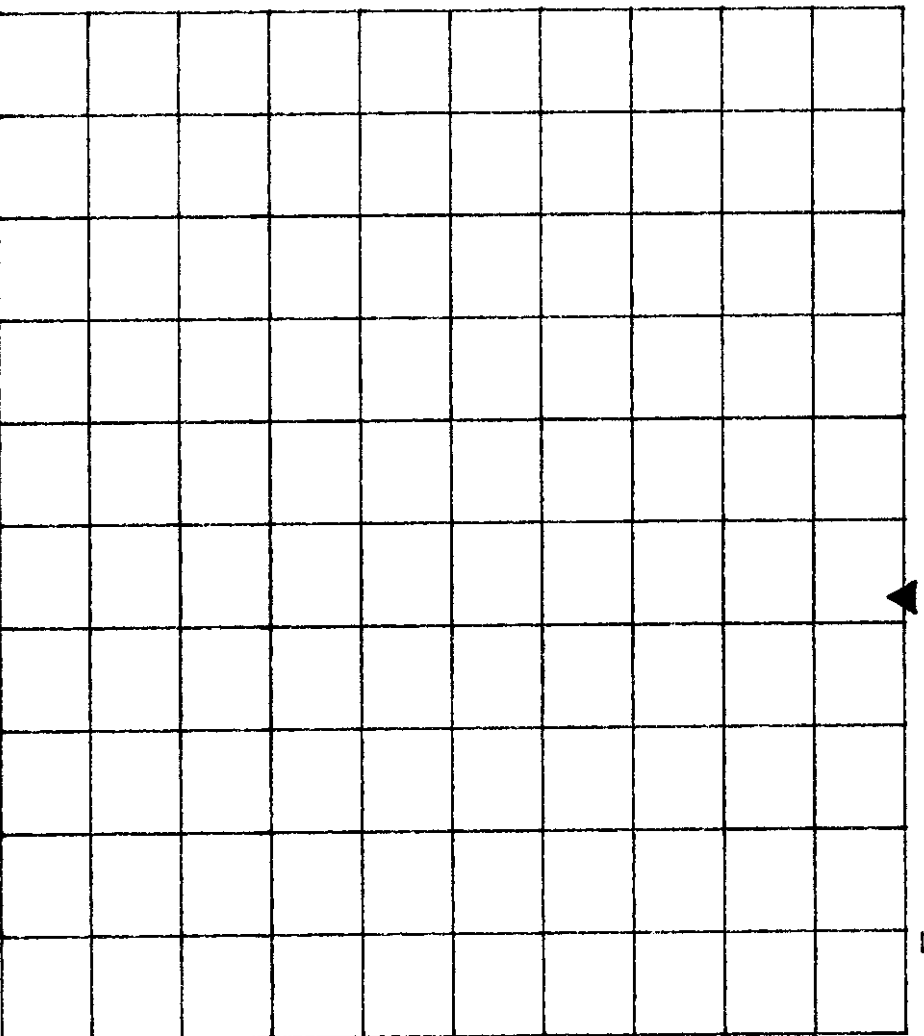
Channel 586

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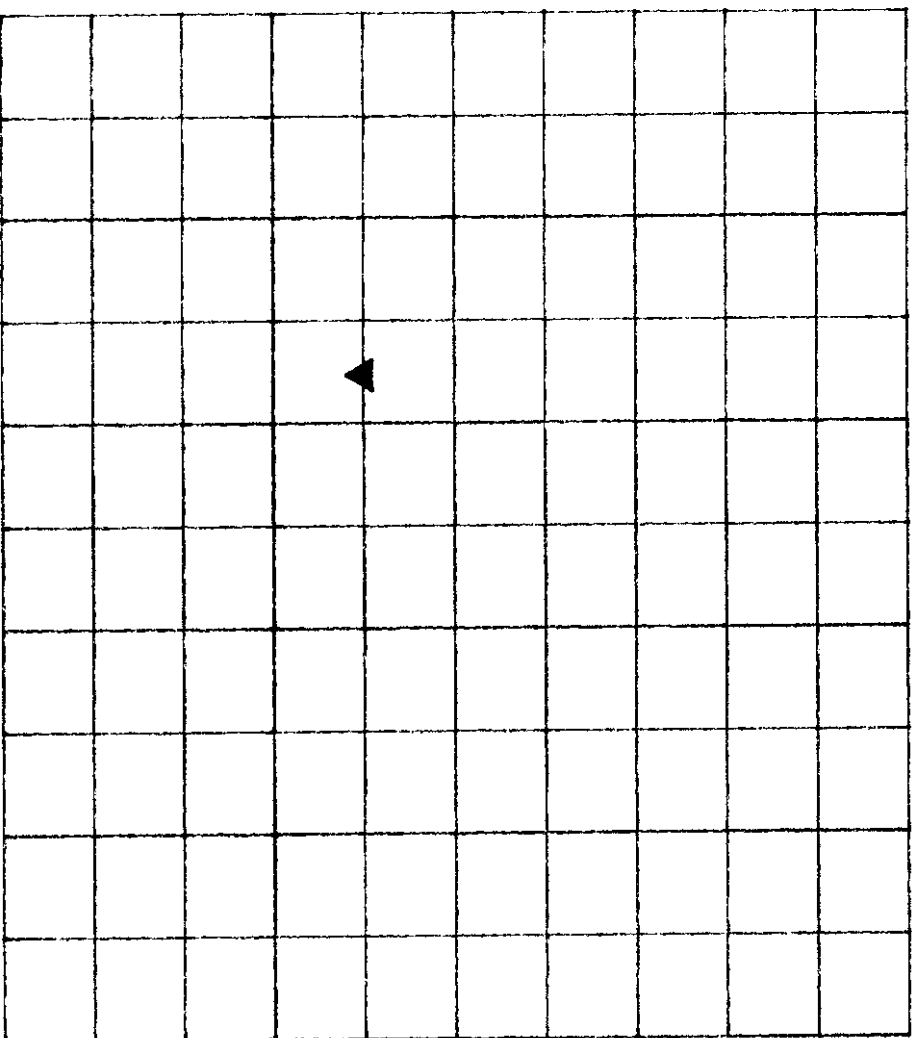
Channel 611

B blank



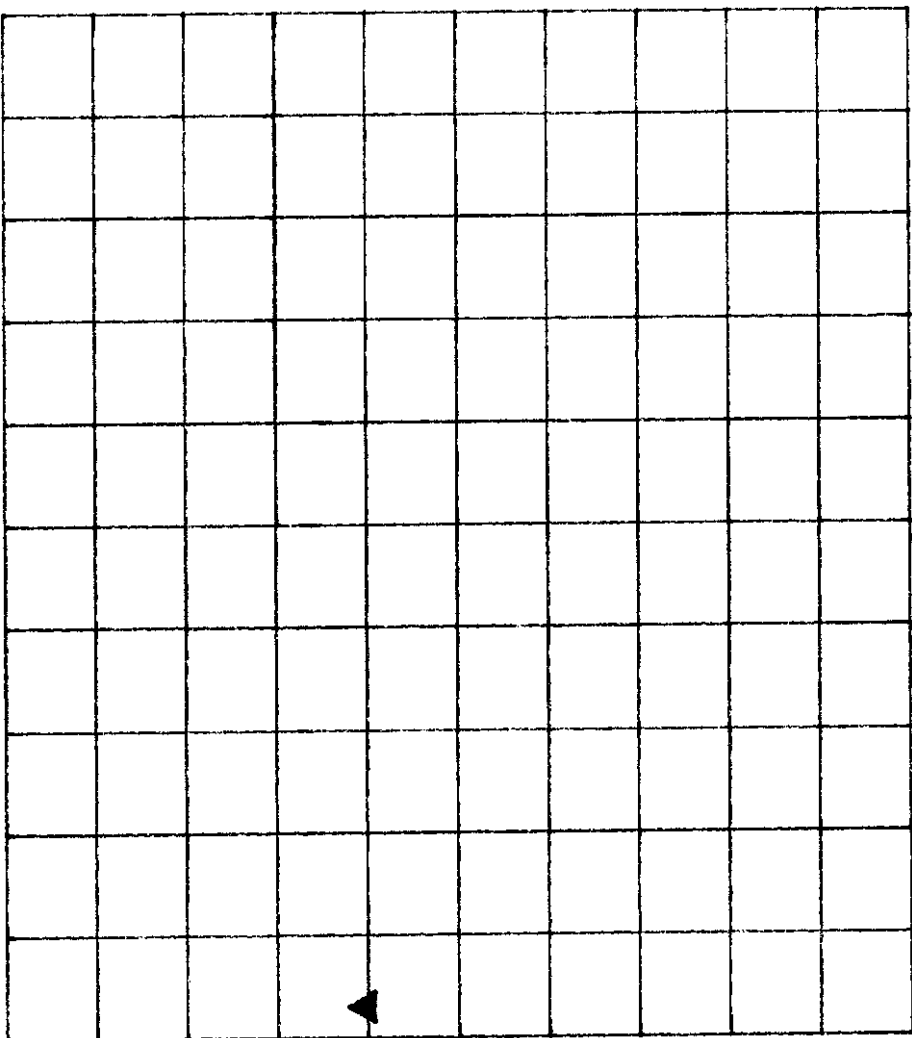
Channel 6/11

B\_blank



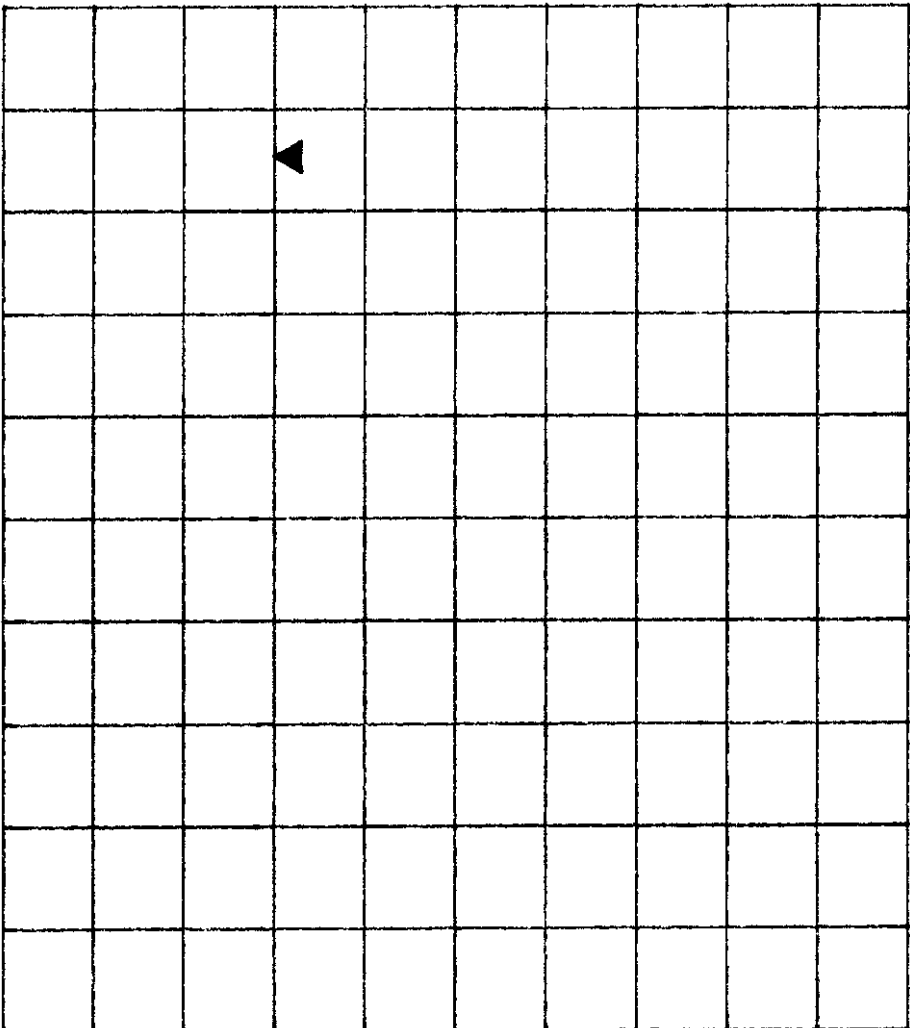
Channel 611

B\_blank



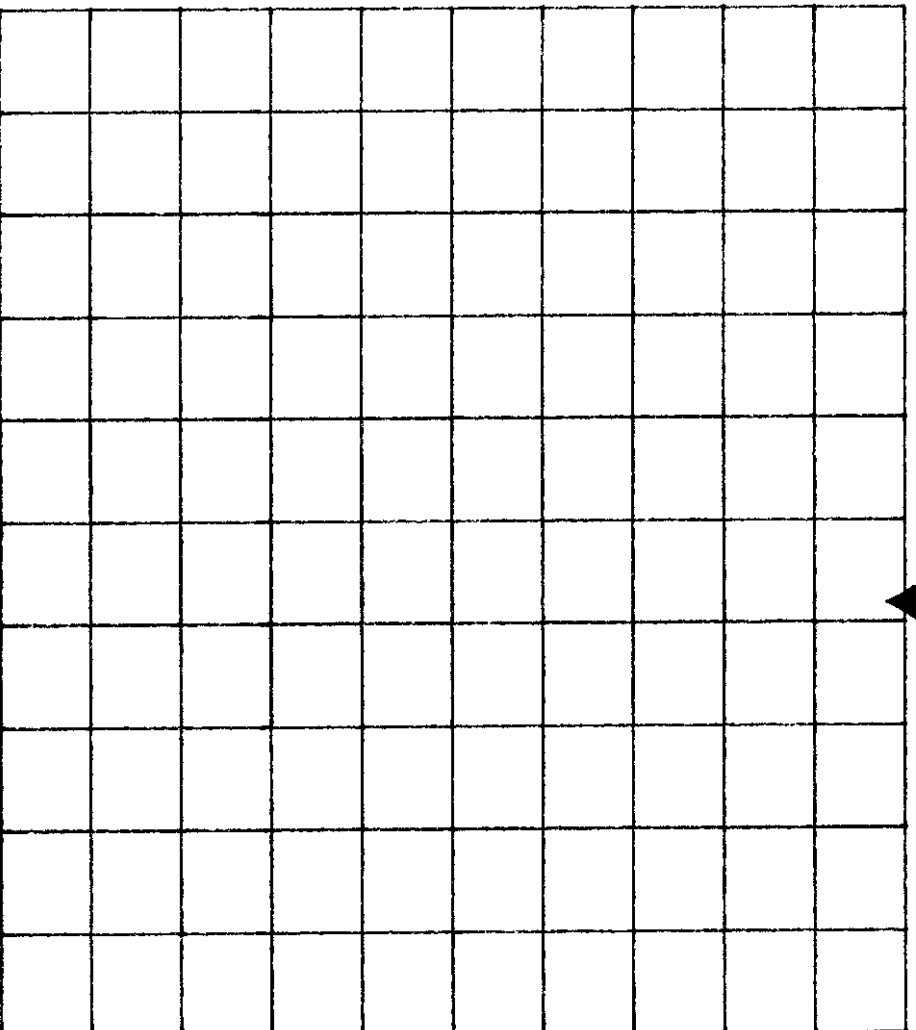
Channel 611

B\_blank



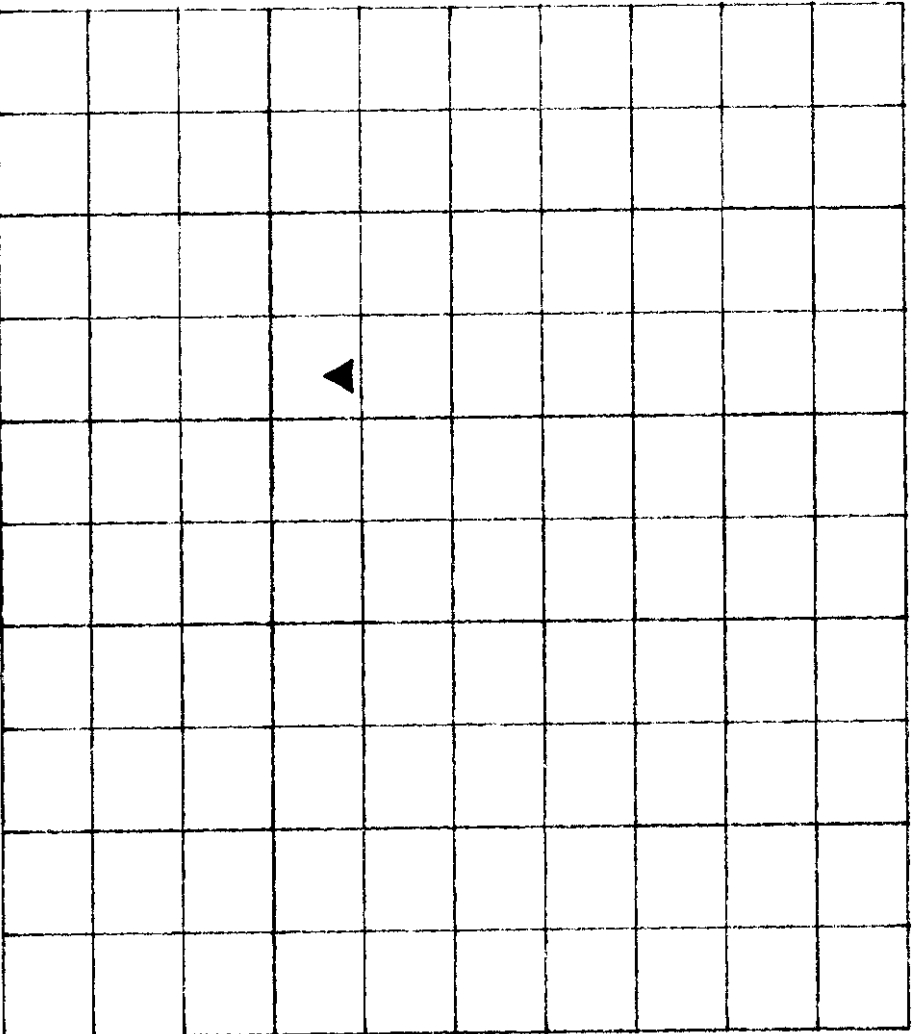
Channel 661

B\_blank



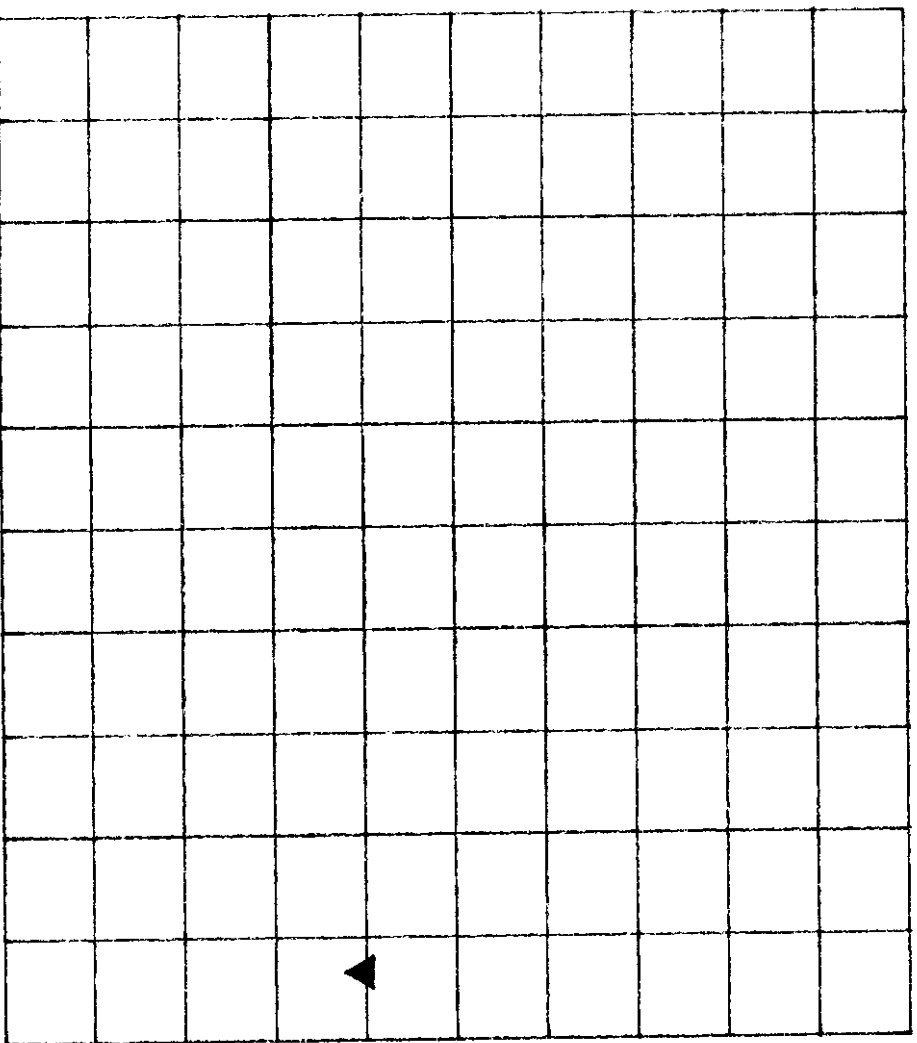
Channel 661

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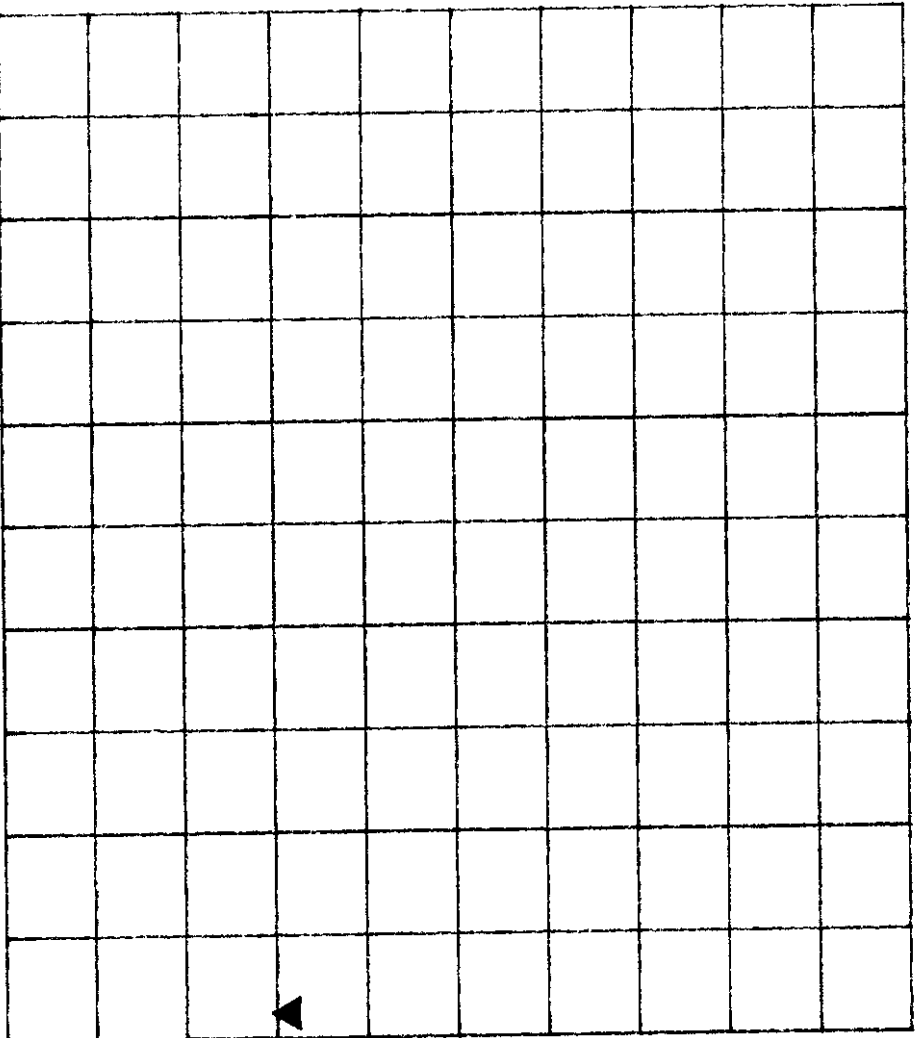
Channel 661

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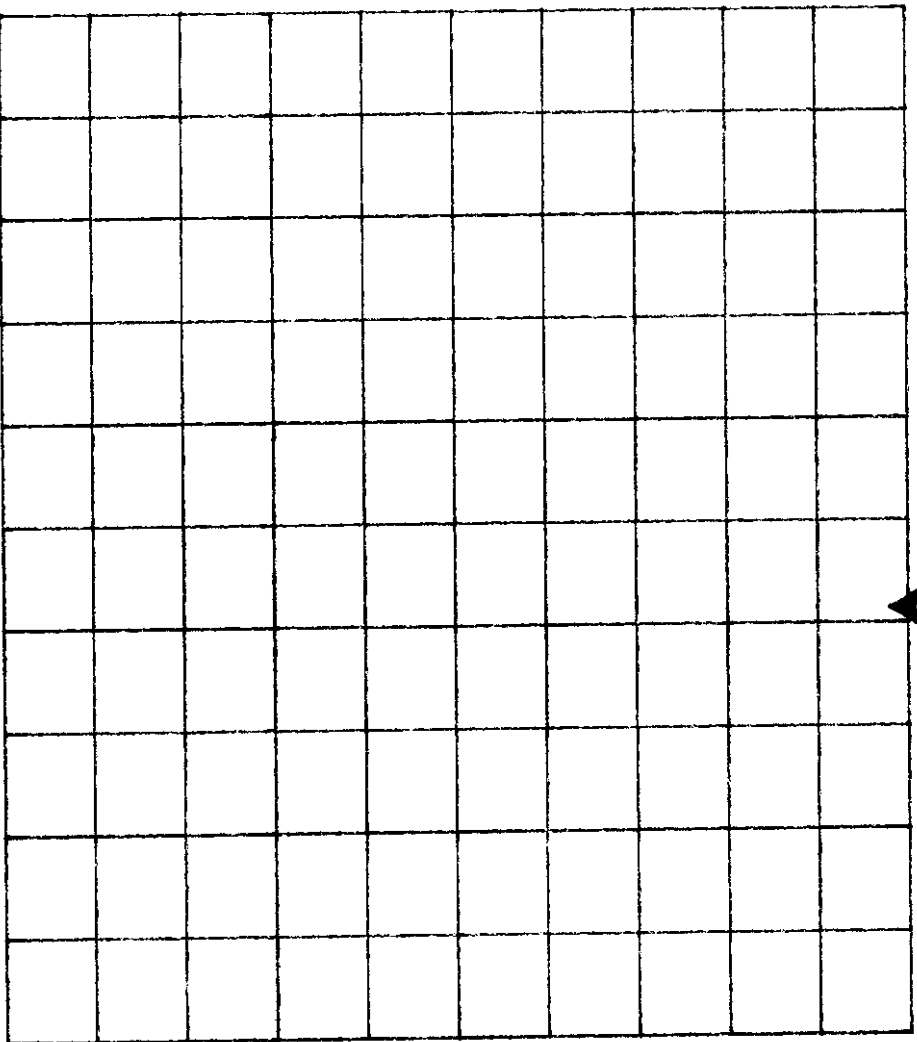
Channel 661

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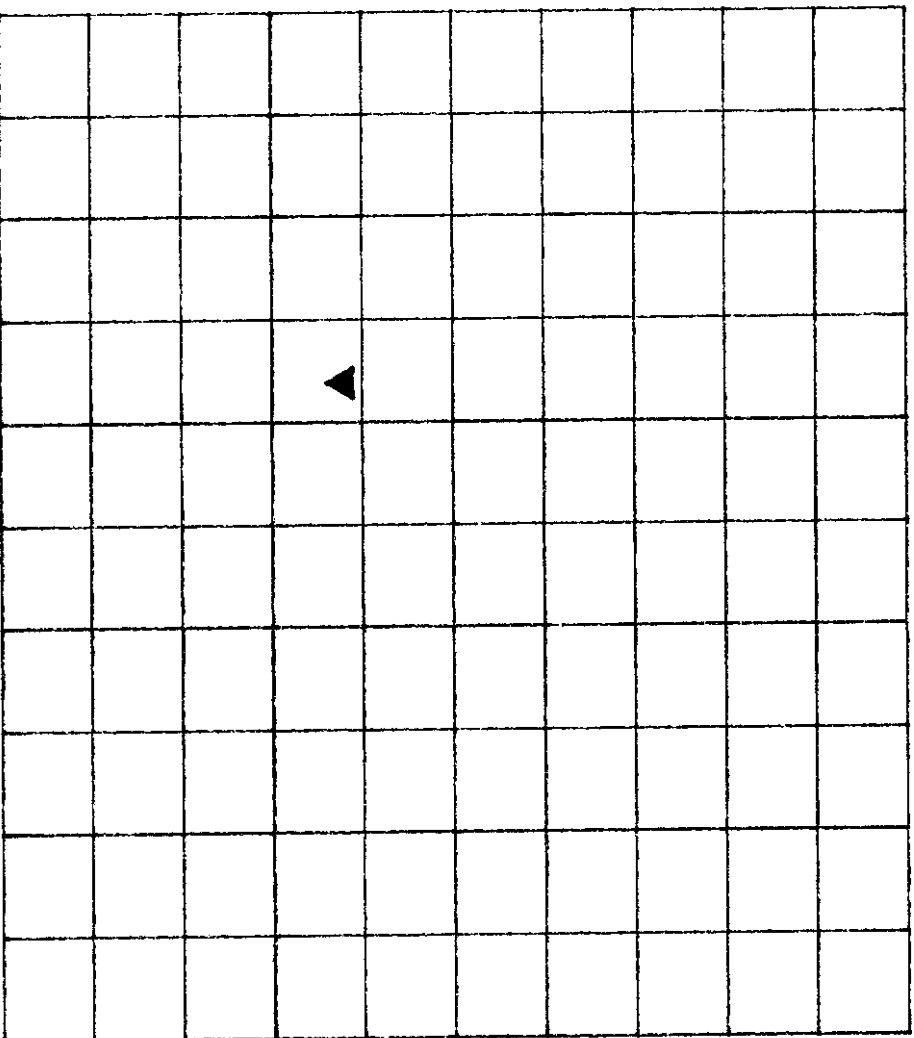
Channel 685

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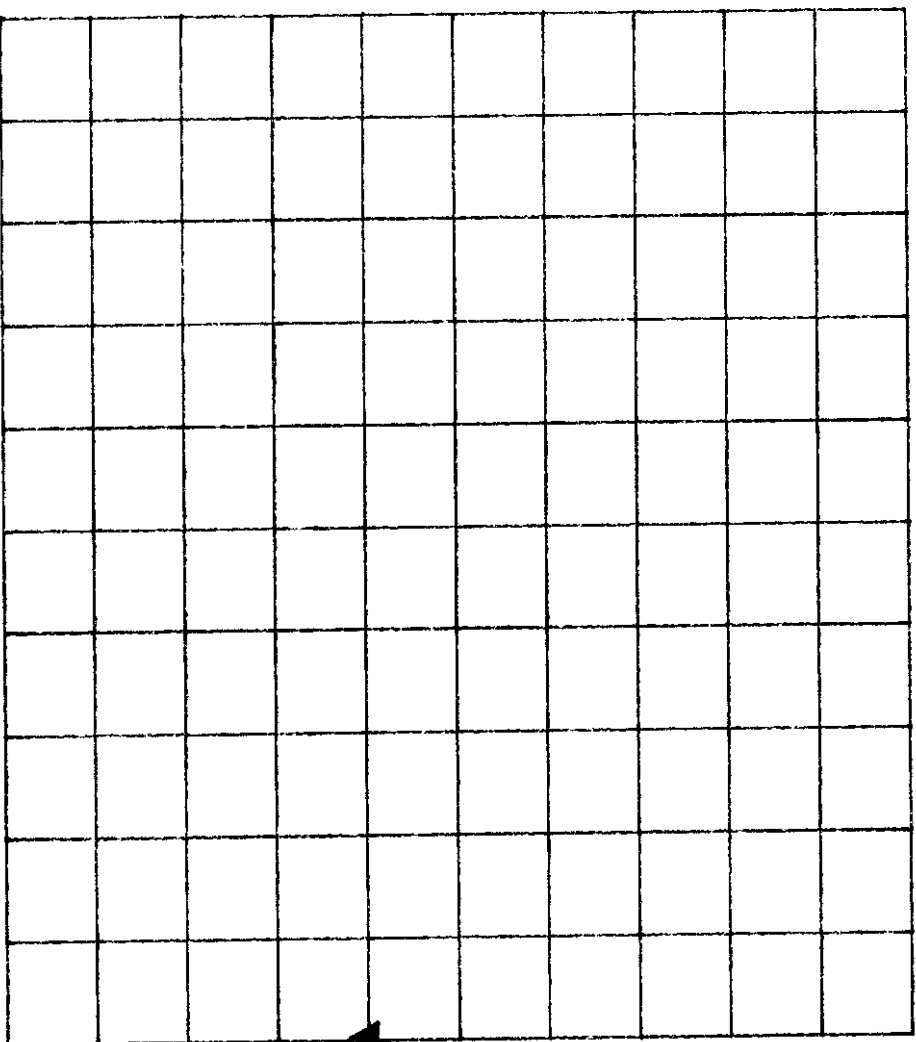
Channel 686

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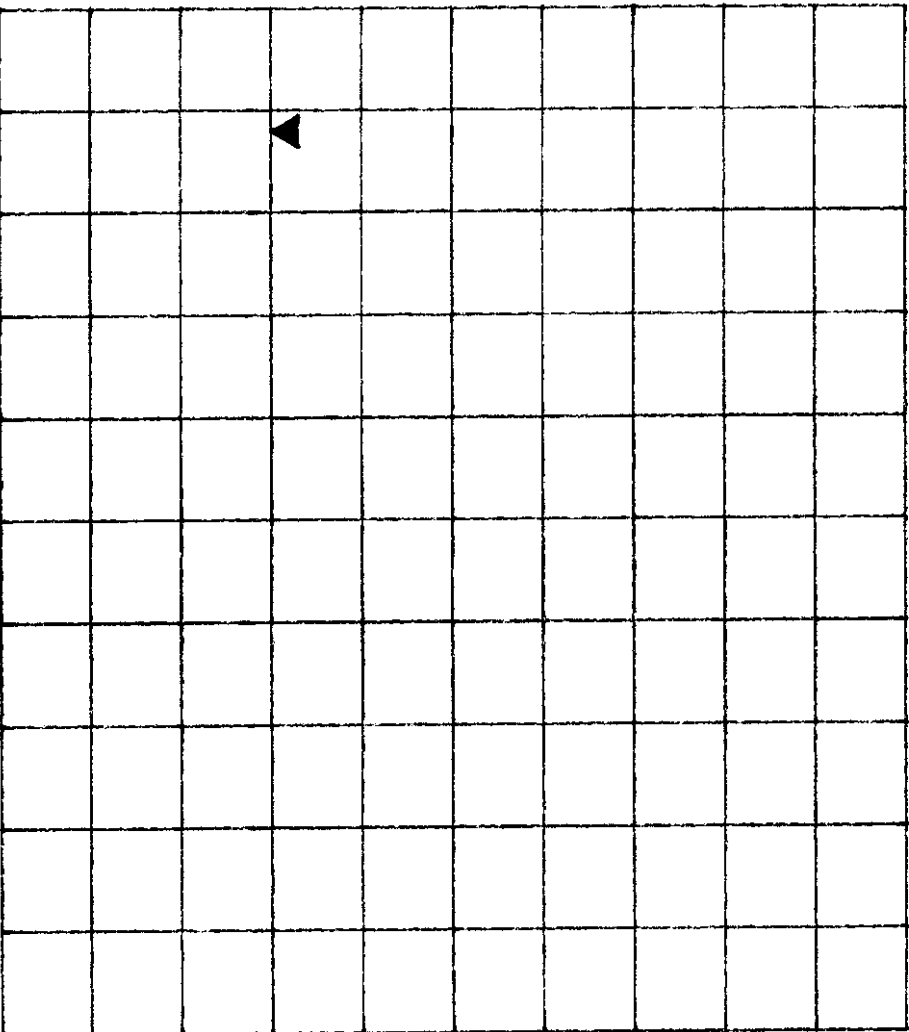
Channel 686

B\_blank



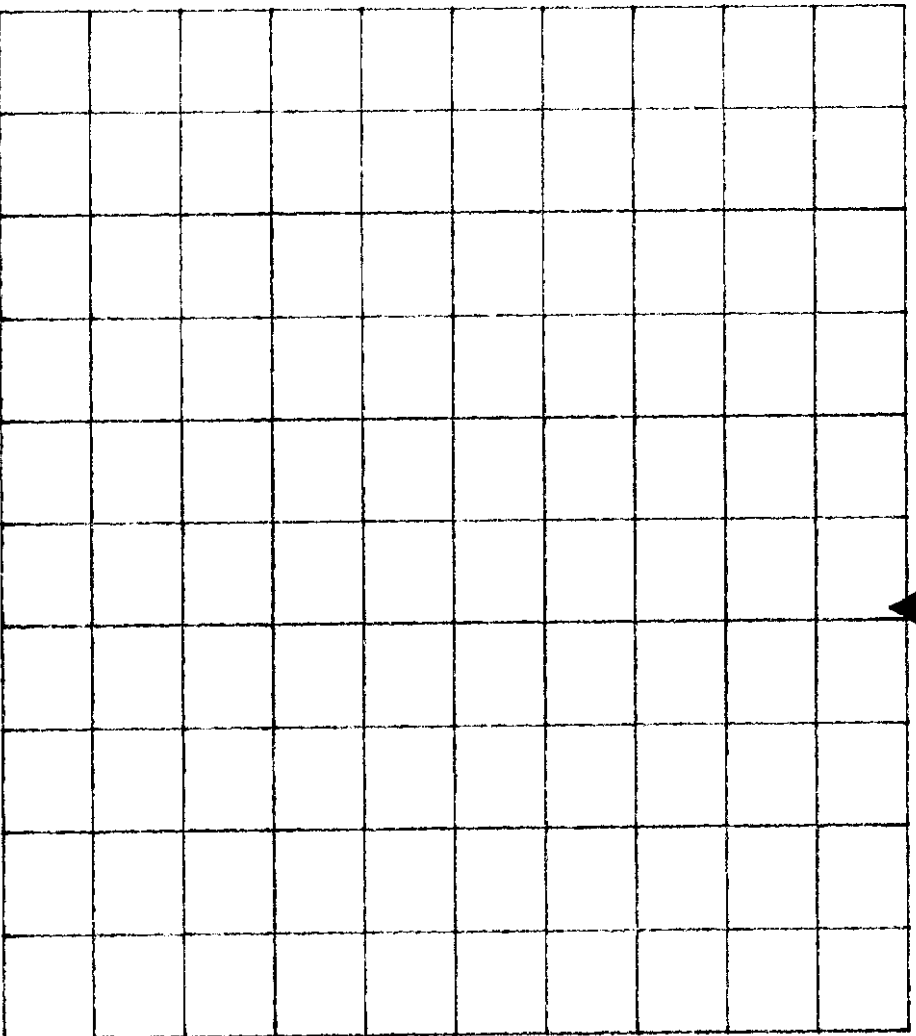
Channel 686

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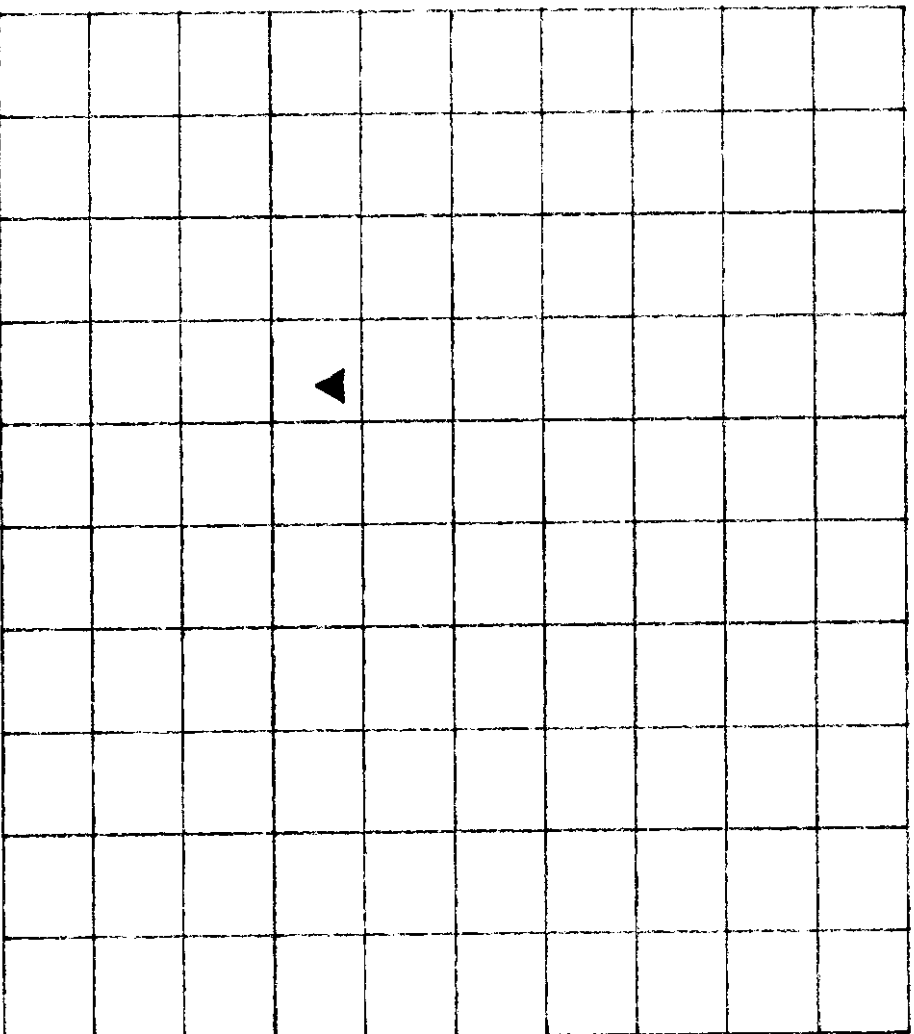
Channel 711

B\_plank



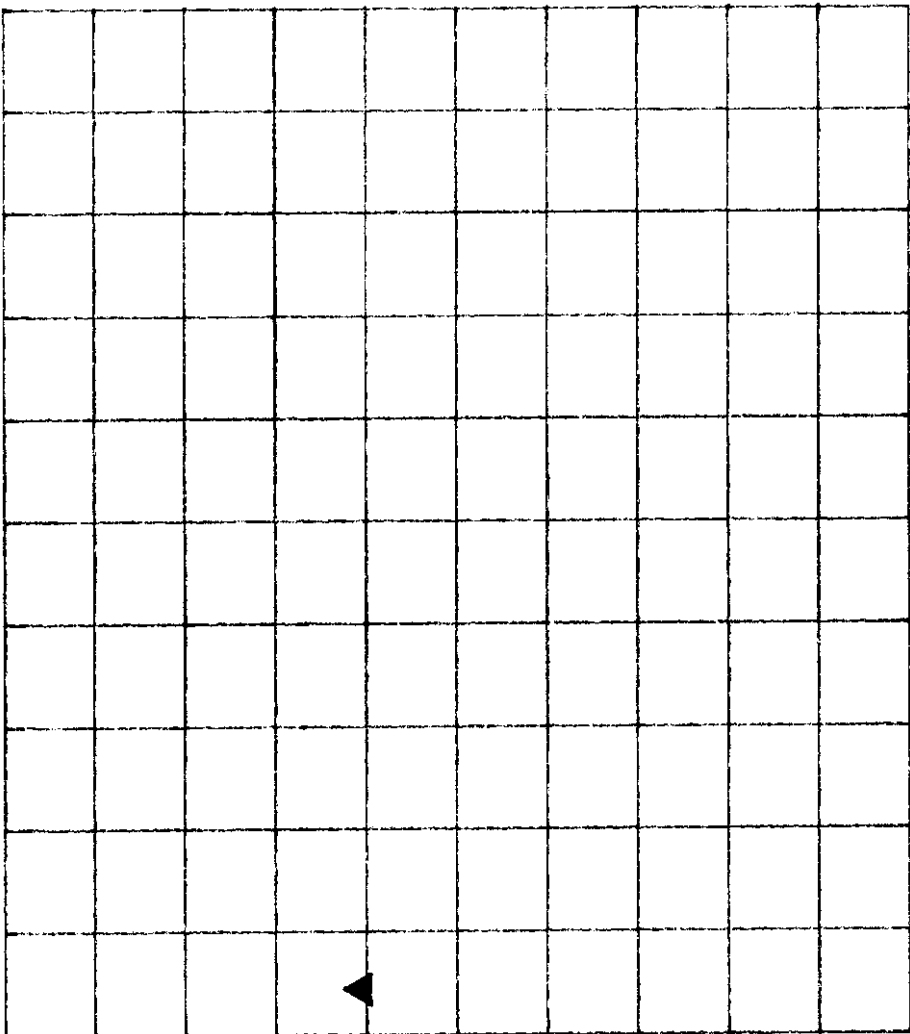
Channel 711

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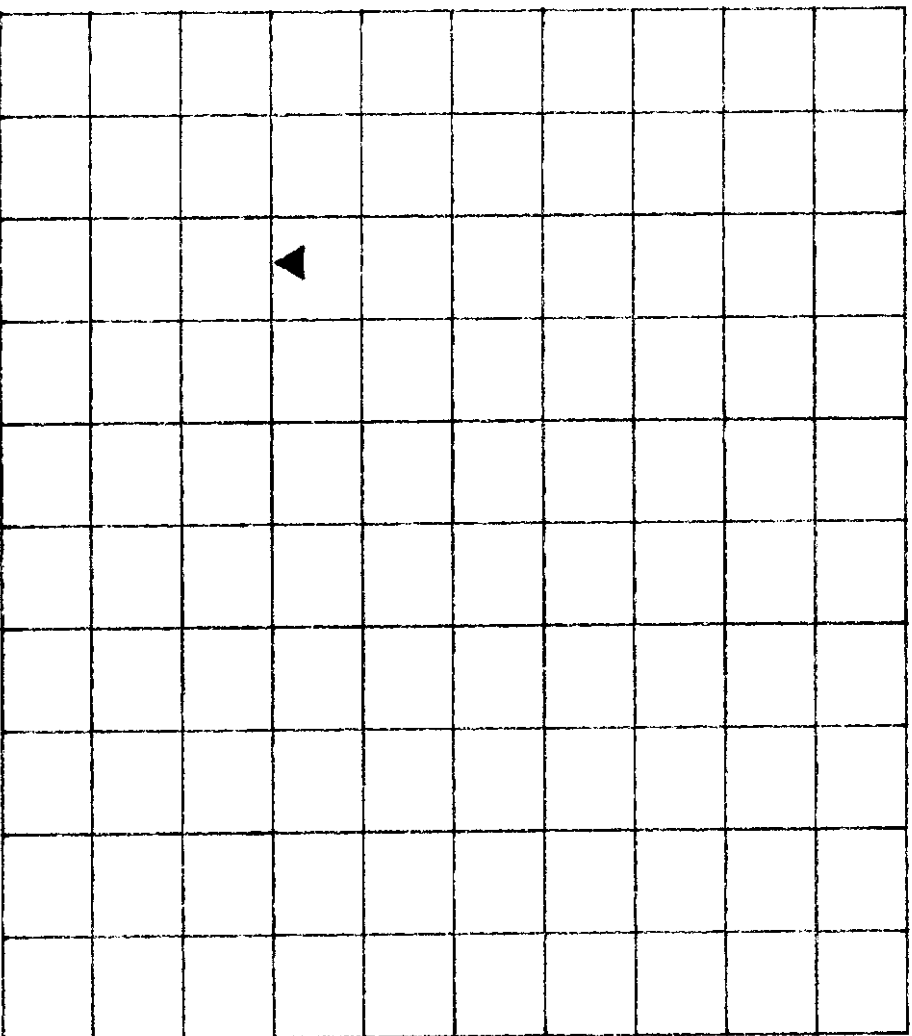
Channel 711

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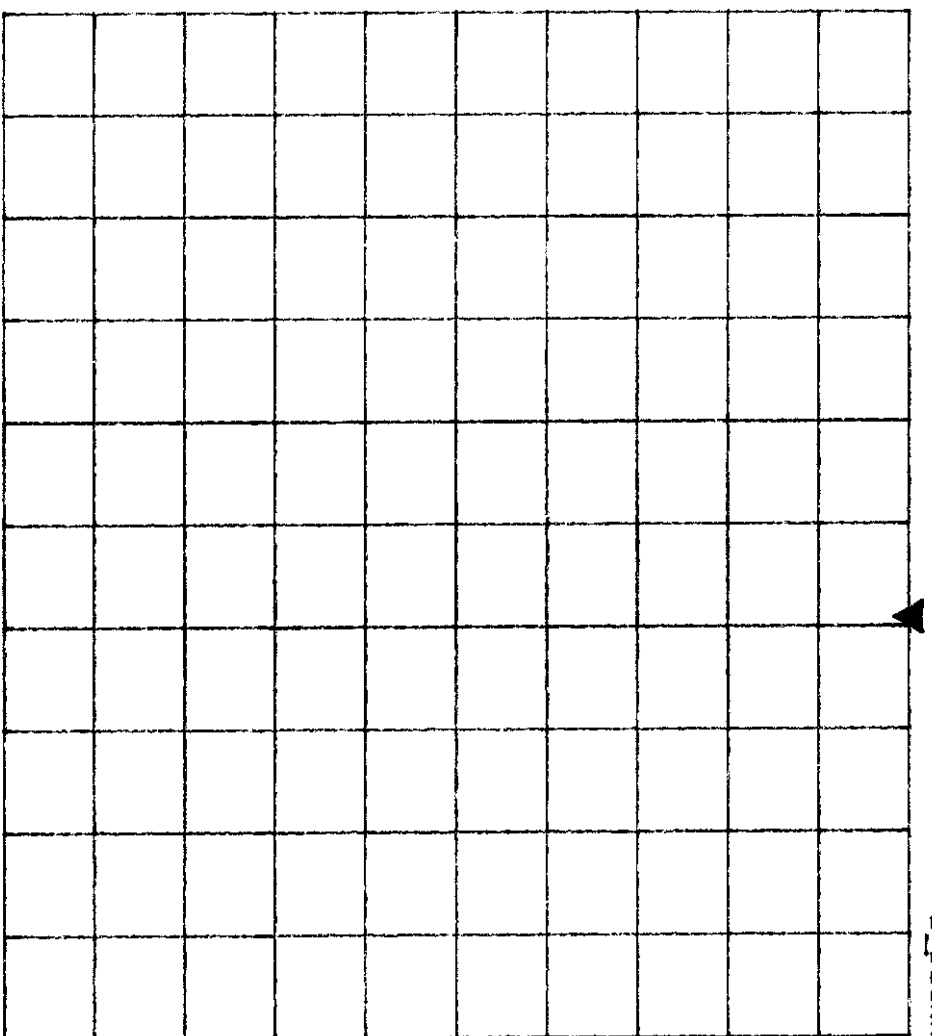
Channel 711

B\_plank



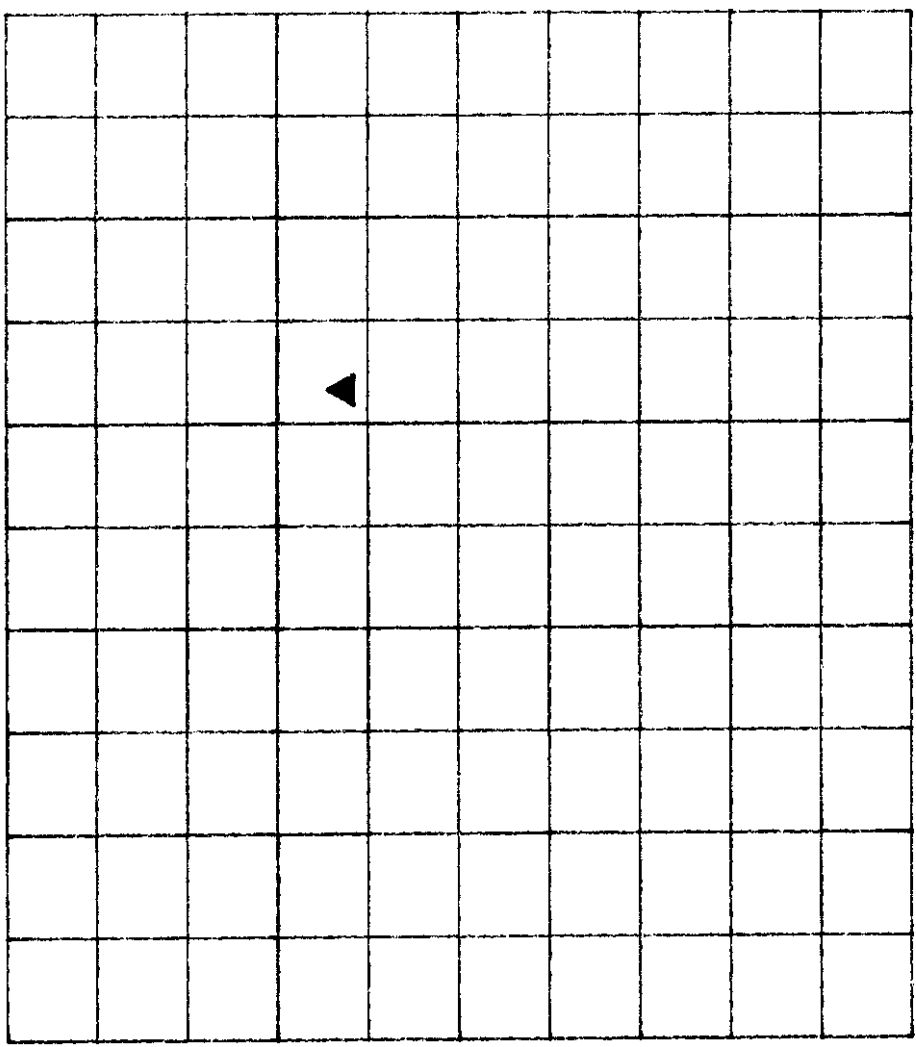
Channel 736

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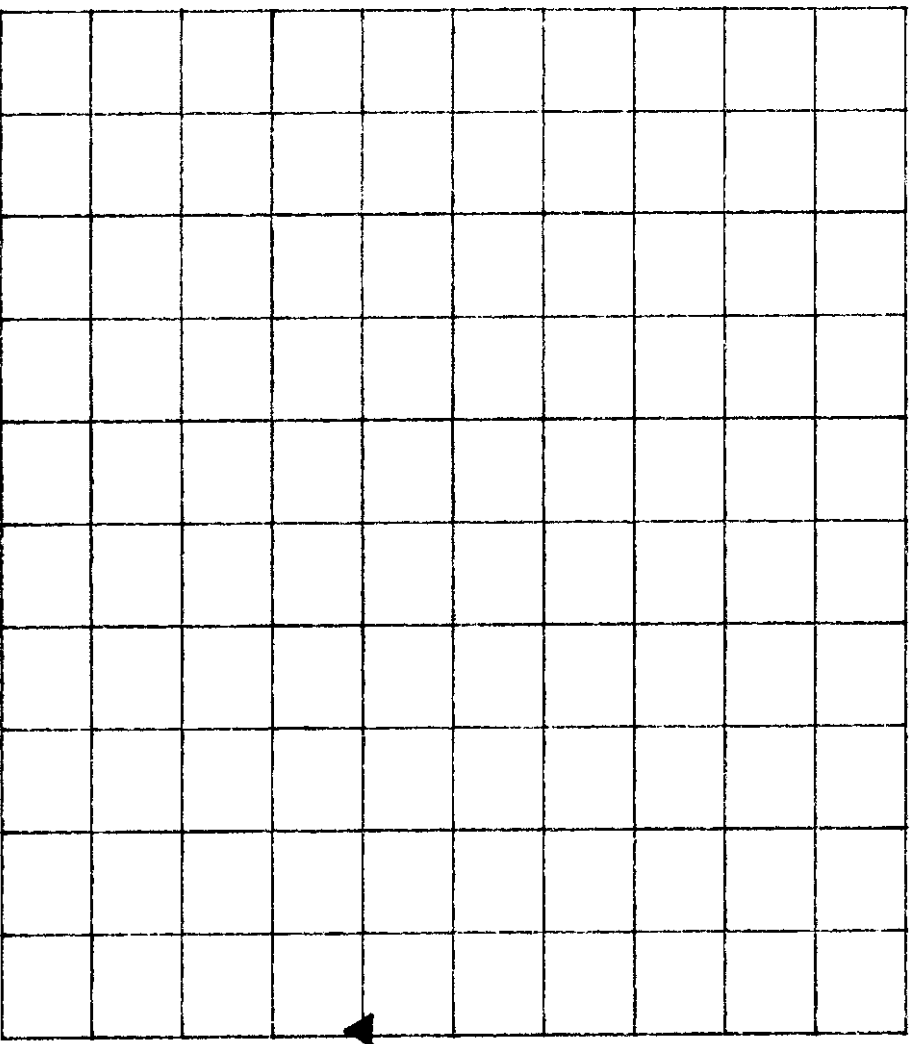
Channel 736

B\_blank



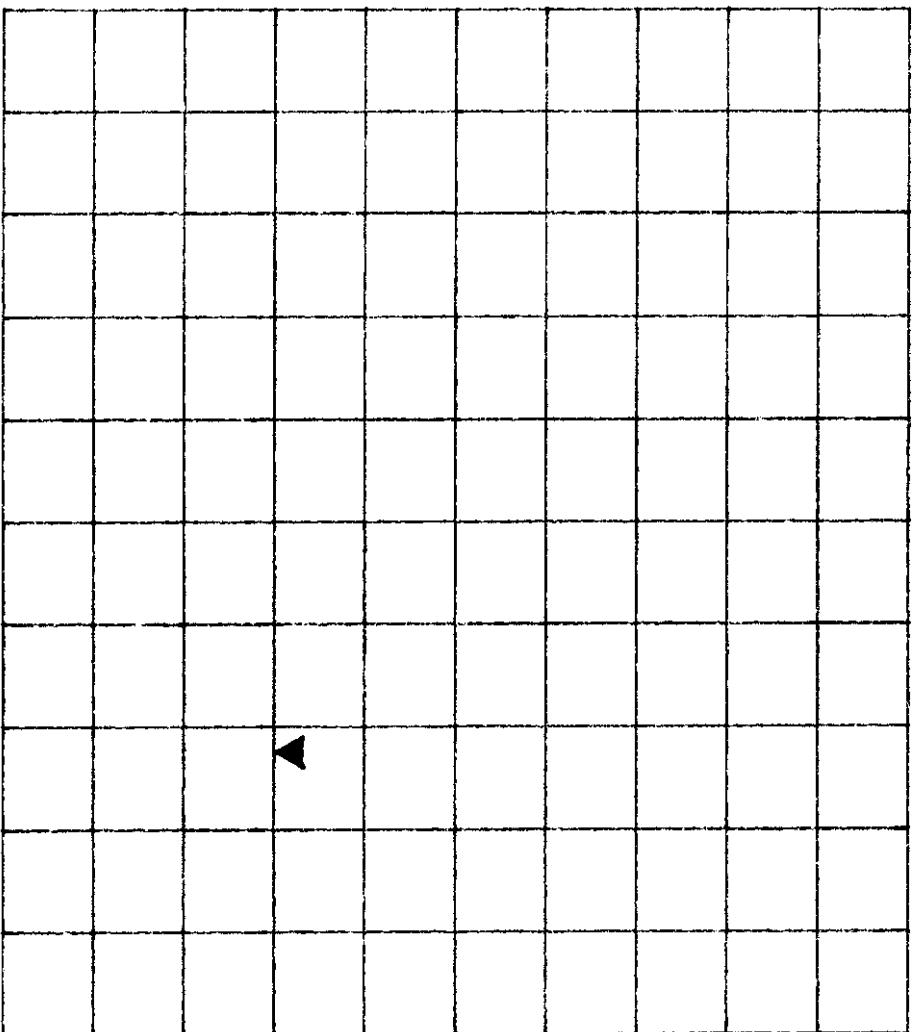
Channel 736

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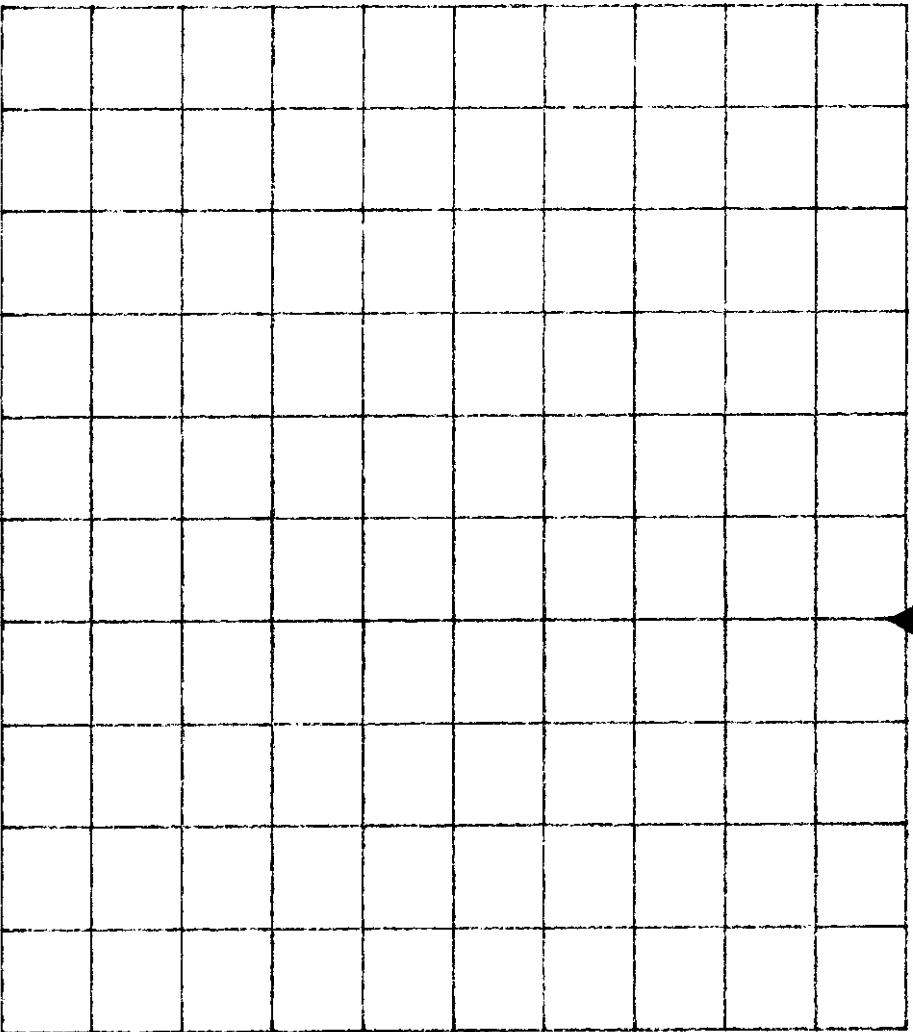
Channel 736

B\_plank



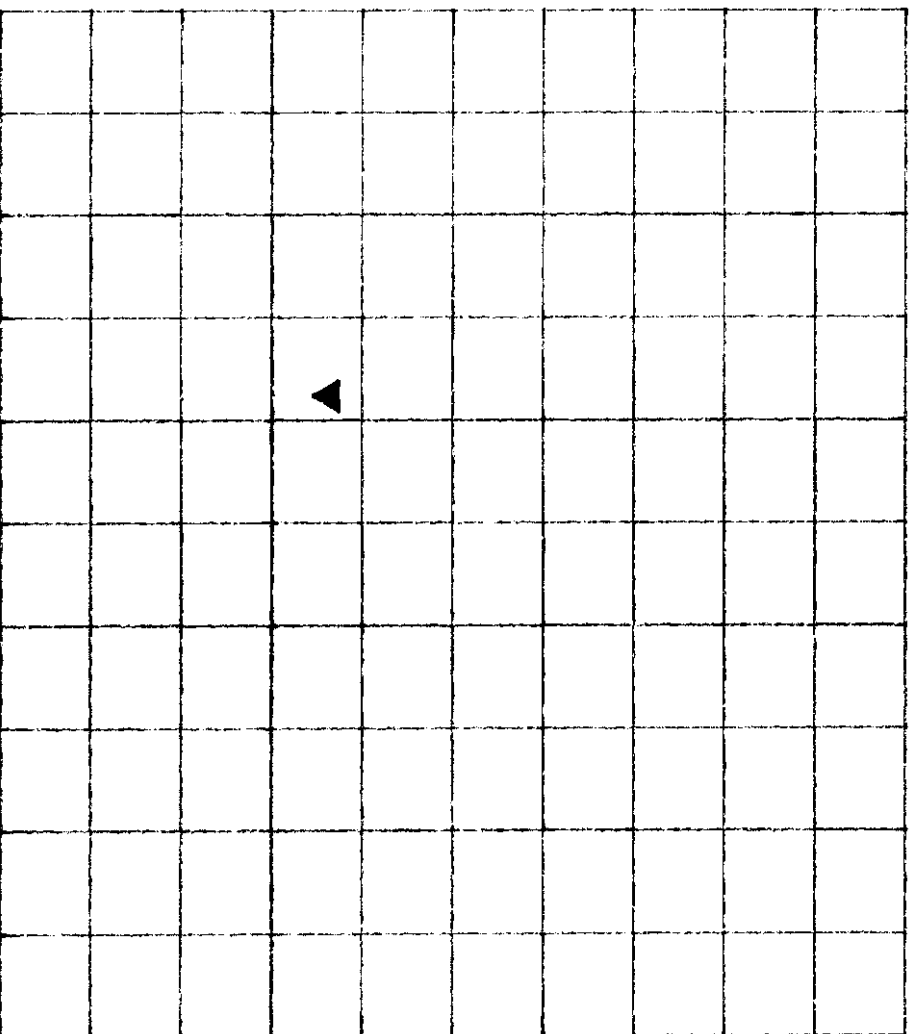
Channel 810

B blank



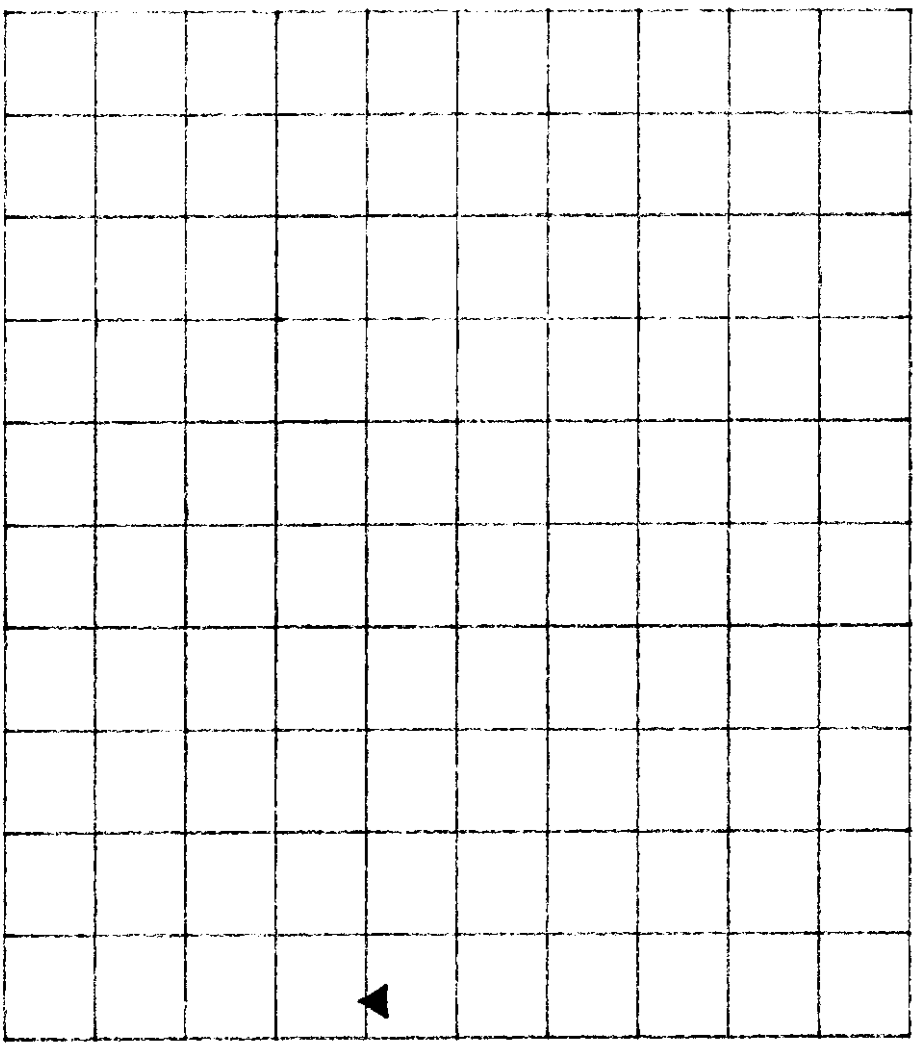
Channel 810

B\_blank



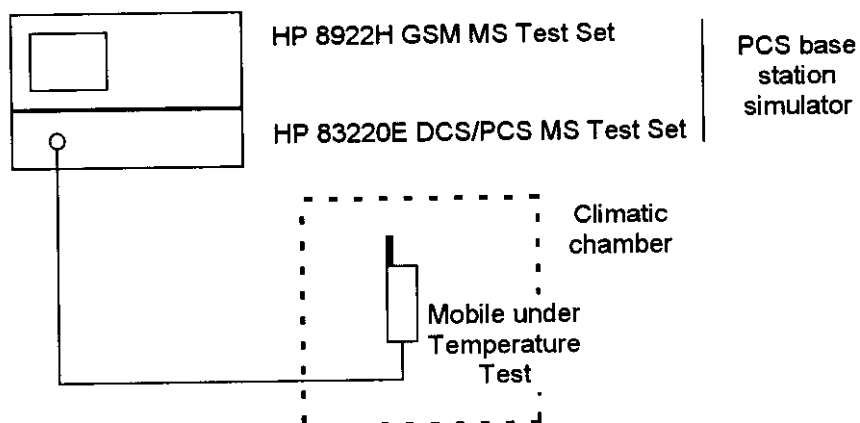
Channel 810

B<sub>b</sub>1ank



Channel 840

### 3.6. MEASUREMENTS REQUIRED. FREQUENCY STABILITY.



The mobile is in a communication with the PCS base station simulator. The transmitted power is 1 Watt.

For each value of temperature reached and for both minimal and nominal supply voltage values, the frequency measurement is made after 10 minutes.

Minimal supply voltage is 3.4 V.

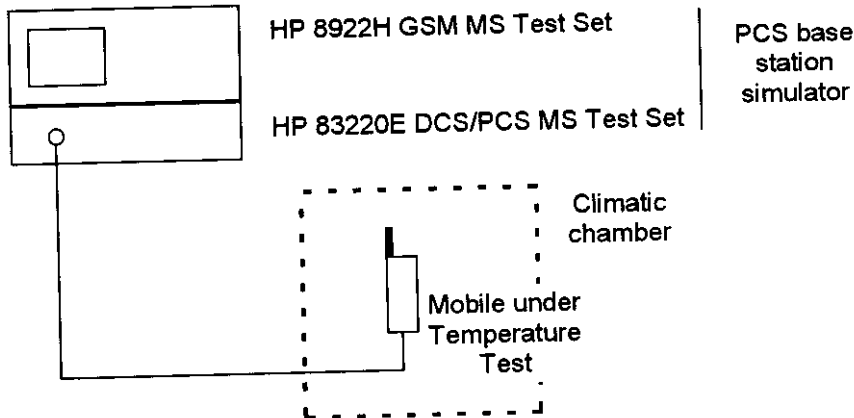
Nominal supply voltage is 3.8 V.

(The values are given in Hertz, compared to the theoretical value).

| Temperature           | T = -30°C |      | T = -20°C |      | T = -10°C |      | T = 0°C |      | T = +10°C |      | T = +20°C |      | T = +30°C |      | T = +40°C |      | T = +50°C |      |
|-----------------------|-----------|------|-----------|------|-----------|------|---------|------|-----------|------|-----------|------|-----------|------|-----------|------|-----------|------|
| Power supply voltage  | 3.4V      | 3.8V | 3.4V      | 3.8V | 3.4V      | 3.8V | 3.4V    | 3.8V | 3.4V      | 3.8V | 3.4V      | 3.8V | 3.4V      | 3.8V | 3.4V      | 3.8V | 3.4V      | 3.8V |
| Channel               |           |      |           |      |           |      |         |      |           |      |           |      |           |      |           |      |           |      |
| 512<br>f = 1850.2 MHz | +43       | -16  | -16       | +40  | +29       | +34  | +21     | +30  | +51       | +46  | +37       | +41  | +34       | -18  | +17       | +50  | +42       | +31  |
| 586<br>f = 1865.0 MHz | +39       | +19  | +24       | +36  | +23       | +55  | +42     | +45  | +24       | +48  | +42       | +41  | +39       | +50  | +12       | +57  | +40       | +40  |
| 611<br>f = 1870.0 MHz | -17       | +48  | +28       | +34  | +32       | +16  | +36     | +49  | +47       | +38  | +51       | +41  | +34       | +41  | +15       | +55  | +40       | +59  |
| 686<br>f = 1885.0 MHz | +56       | +52  | +36       | +55  | +44       | +35  | +42     | +50  | +68       | +65  | +58       | +42  | +54       | +44  | +69       | +68  | +43       | +71  |
| 711<br>f = 1890.0 MHz | +59       | +50  | +53       | +45  | +46       | +35  | +57     | +59  | +35       | +66  | +48       | +45  | +51       | +34  | +72       | +58  | +36       | +29  |
| 736<br>f = 1895.0 MHz | +54       | +39  | +49       | +42  | +45       | +42  | +69     | +62  | +43       | +39  | +34       | +61  | +56       | +39  | +69       | +61  | +31       | +44  |
| 810<br>f = 1909.8 MHz | +69       | +91  | +71       | +49  | +64       | +60  | +56     | +65  | +69       | +74  | +69       | +91  | +59       | +88  | +59       | +69  | -22       | +52  |

FREQUENCY DIFFERENCE WITH THEORETICAL VALUE (IN Hz)

### 3.6. MEASUREMENTS REQUIRED. FREQUENCY STABILITY.



The mobile is on a communication with the PCS base station simulator. The transmitted power is 1 Watt.

For each value of temperature reached and for both minimal and nominal supply voltage values, the frequency measurement is made after 10 minutes.

Minimal supply voltage is 3.4 V.

Nominal supply voltage is 3.8 V.

(The values are given in Hertz, compared to the theoretical value).

| Temperature           | T = -30°C |      | T = -20°C |      | T = -10°C |      | T = 0°C |      | T = +10°C |      | T = +20°C |      | T = +30°C |      | T = +40°C |      | T = +50°C |      |
|-----------------------|-----------|------|-----------|------|-----------|------|---------|------|-----------|------|-----------|------|-----------|------|-----------|------|-----------|------|
| Power supply voltage  | 3.4V      | 3.8V | 3.4V      | 3.8V | 3.4V      | 3.8V | 3.4V    | 3.8V | 3.4V      | 3.8V | 3.4V      | 3.8V | 3.4V      | 3.8V | 3.4V      | 3.8V | 3.4V      | 3.8V |
| Channel               |           |      |           |      |           |      |         |      |           |      |           |      |           |      |           |      |           |      |
| 512<br>f = 1850.2 MHz | +43       | -16  | -16       | +40  | +29       | +34  | +21     | +30  | +51       | +46  | +37       | +41  | +34       | -18  | +17       | +50  | +42       | +31  |
| 586<br>f = 1865.0 MHz | +39       | +19  | +24       | +36  | +23       | +55  | +42     | +45  | +24       | +48  | +42       | +41  | +39       | +50  | +12       | +57  | +40       | +40  |
| 611<br>f = 1870.0 MHz | -17       | +48  | +28       | +34  | +32       | +16  | +36     | +49  | +47       | +38  | +51       | +41  | +34       | +41  | +15       | +55  | +40       | +59  |
| 686<br>f = 1885.0 MHz | +56       | +52  | +36       | +55  | +44       | +35  | +42     | +50  | +68       | +65  | +58       | +42  | +54       | +44  | +69       | +68  | +43       | +71  |
| 711<br>f = 1890.0 MHz | +59       | +50  | +53       | +45  | +46       | +35  | +57     | +59  | +35       | +66  | +48       | +45  | +51       | +34  | +72       | +58  | +36       | +29  |
| 736<br>f = 1895.0 MHz | +54       | +39  | +49       | +42  | +45       | +42  | +69     | +62  | +43       | +39  | +34       | +61  | +56       | +39  | +69       | +61  | +31       | +44  |
| 810<br>f = 1909.8 MHz | +69       | +91  | +71       | +49  | +64       | +60  | +56     | +65  | +69       | +74  | +69       | +91  | +59       | +88  | +59       | +69  | -22       | +52  |

FREQUENCY DIFFERENCE WITH THEORETICAL VALUE (IN Hz)