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**Temperature Microstructure Profiles
at Ocean Station P: Preliminary
Results from the MILE Experiment**

by
T. M. Dillon
and
D. R. Caldwell

Office of Naval Research
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December 1977

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Preliminary temperature microstructure profiles resulting from the Mixed Layer Experiment at Ocean Station P (144°W, 55°N) during August-September 1977 are presented. Depth ranges plotted are from 5 meters to 70 meters. The profiles show the behavior of the mixed layer and thermocline before, during, and after two synoptic scale storms.		

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TEMPERATURE MICROSTRUCTURE PROFILES
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George H. Keller

Acting Dean

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INTRODUCTION

This report is a preliminary presentation of temperature microstructure data resulting from the Mixed Layer Experiment (MILE) at Ocean Station P (55°N, 145°W) during August-September 1977. During the MILE experiment, the Caldwell research group conducted 381 casts over a period of 21 days from the R/V OCEANOGRAPHER, using a Microstructure Profiler (MSP). Contained in this report are temperature and temperature derivative profiles over a depth range of 5 m to 70 m from 211 of those casts.

On many of these casts electrical conductivity or optical transmissivity sensors were also operating, but these were omitted in order that this report might be available to other participants in the cruise at the time of the first post-cruise meeting. At a later date we hope to publish a more complete report, adding not only salinity and transmissivity profiles, but also including a number of casts made to greater depths, often 180 m.

EXPERIMENTAL DESCRIPTION

Six MSP units, conceptually similar to the profiler described by Caldwell, Wilcox and Matsler (1975), were used. Casts began 0500 August 19, 1977 GMT and ended 1200 September 8, 1977 GMT. They took place every night but two, on which CTD surveys took place.

During the experiment, two synoptic-scale storms occurred at Station P. The first, with winds to 38 knots, began at approximately 1200 August 22, 1977 GMT, and lasted until 1400 August 24, 1977. The second was milder, with winds to 33 knots, and lasted from 1200 August 31, 1977 GMT until 0000 September 2, 1977 GMT (Figure 1). Casts were made before, during, and after each storm, and reflect the effect of mixing brought about by the storms and the relaxation to a more quiescent state following each storm.

The schedule of observations began after local sundown and ended before local sunrise, thus aliasing events with a diurnal time scale. Large excursions of temperature structures within the thermocline region were noted which may often be attributable to internal wave activity. An attempt was made to hold station relative to the MILE I mooring during a sequence of casts; however, both ship drift and advection insure that the same water column is not sampled twice, so that the profiles also show the effects of horizontal inhomogeneities. Thus, it is often difficult to attribute changes in features between casts to either temporal or spatial effects alone.

Temperature and pressure calibrations for each unit were performed before the cruise. Post-cruise calibrations revealed that the electronic circuit characteristics were quite stable during the cruise. The temp-

erature versus resistance characteristics of the thermistors did not fare as well, showing a marked drift during the cruise. Since our interest in this report is in small-scale features rather than in absolute accuracy, corrections have not been made for this calibration shift. The profiles shown in this report make use of pre-cruise calibrations only, and no attempt was made to normalize the profile to CTD measured temperatures. Measurements with different MSP units should therefore be treated with some caution.

PROFILE PRESENTATION

Since the typical drop speed of the MSP is about 12 cm/sec and the sampling rate was 90 per second, the typical resolution was 0.13 cm. The record was decimated without averaging to obtain a mean plot density of 200 points per inch. This procedure results in aliasing errors, but was thought to give a better representation of the true high-frequency nature of the temperature derivative signal than could be obtained by plotting averages.

The vertical scale of the temperature profile is depth (meters) and the horizontal scale is degrees (centigrade). The scale of the temperature depth derivative is given in the upper left of each plot. Also given above each plot is the MSP unit (A,B,C,D, or E) with which the data was taken. Next to the unit name is the drop name, which is unique to each cast. Below the plot is given the date and time (GMT).

Near the top of each plot is a small square showing the position at which the cast was taken relative to the MILE I mooring. The sides of the square represent 10 km. True north is upward. The ship position is marked as "x" and the MILE I mooring is marked "+". Below the plot is given the range (km) and bearing (degrees) of the buoy as measured from the vessel.

REFERENCES

- Caldwell, D.R., S.D. Wilcox and M. Matsler (1975). A relatively simple freely-falling probe for small-scale temperature gradients. *Limnology and Oceanography*, 20:1035-1047.

BRIDGE OBSERVATIONS

BUCKET
TEMP.,
DEG. C

SURFACE
STRESS,
DYNES/CM²

WIND
SPEED,
M/SEC

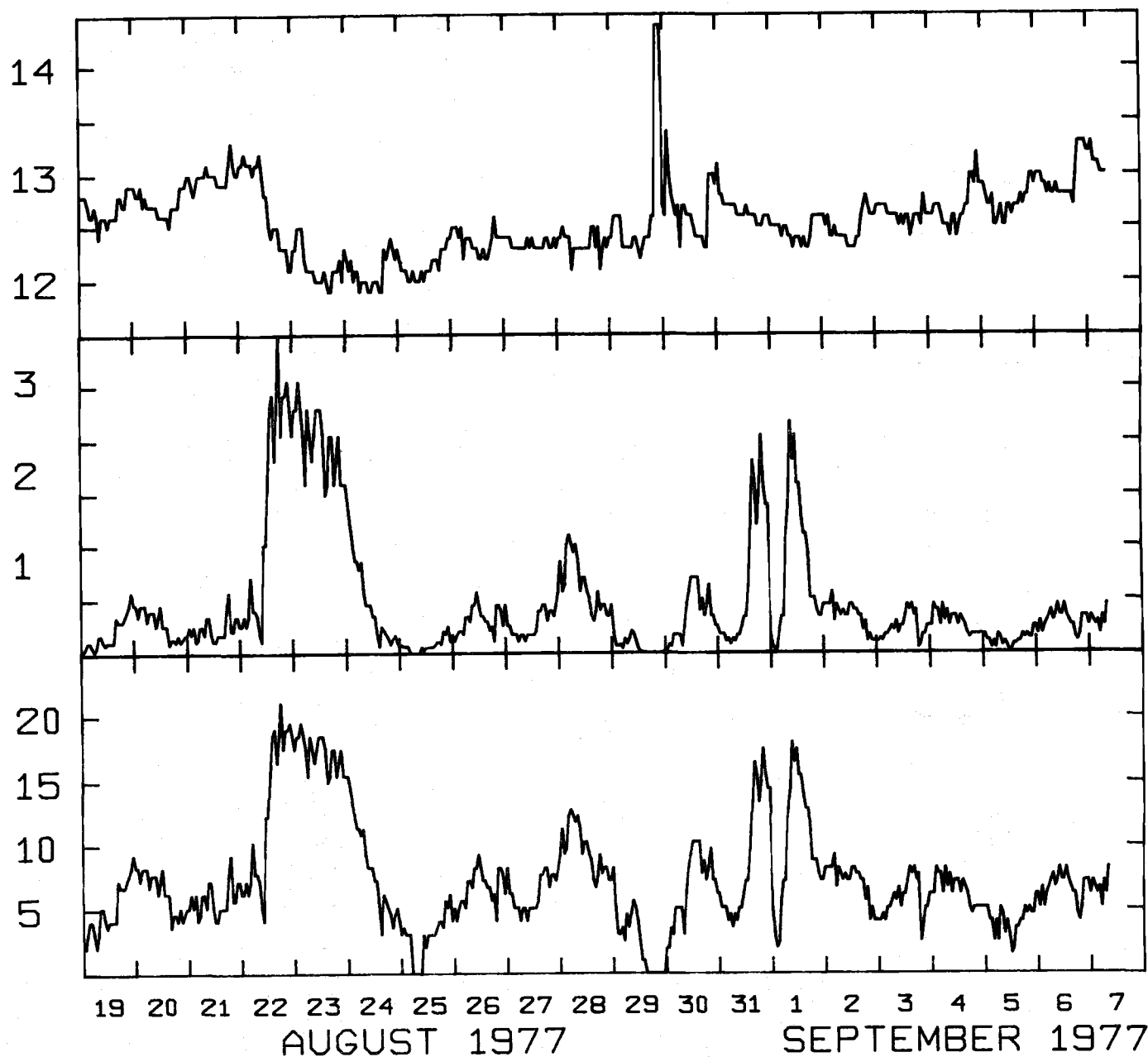
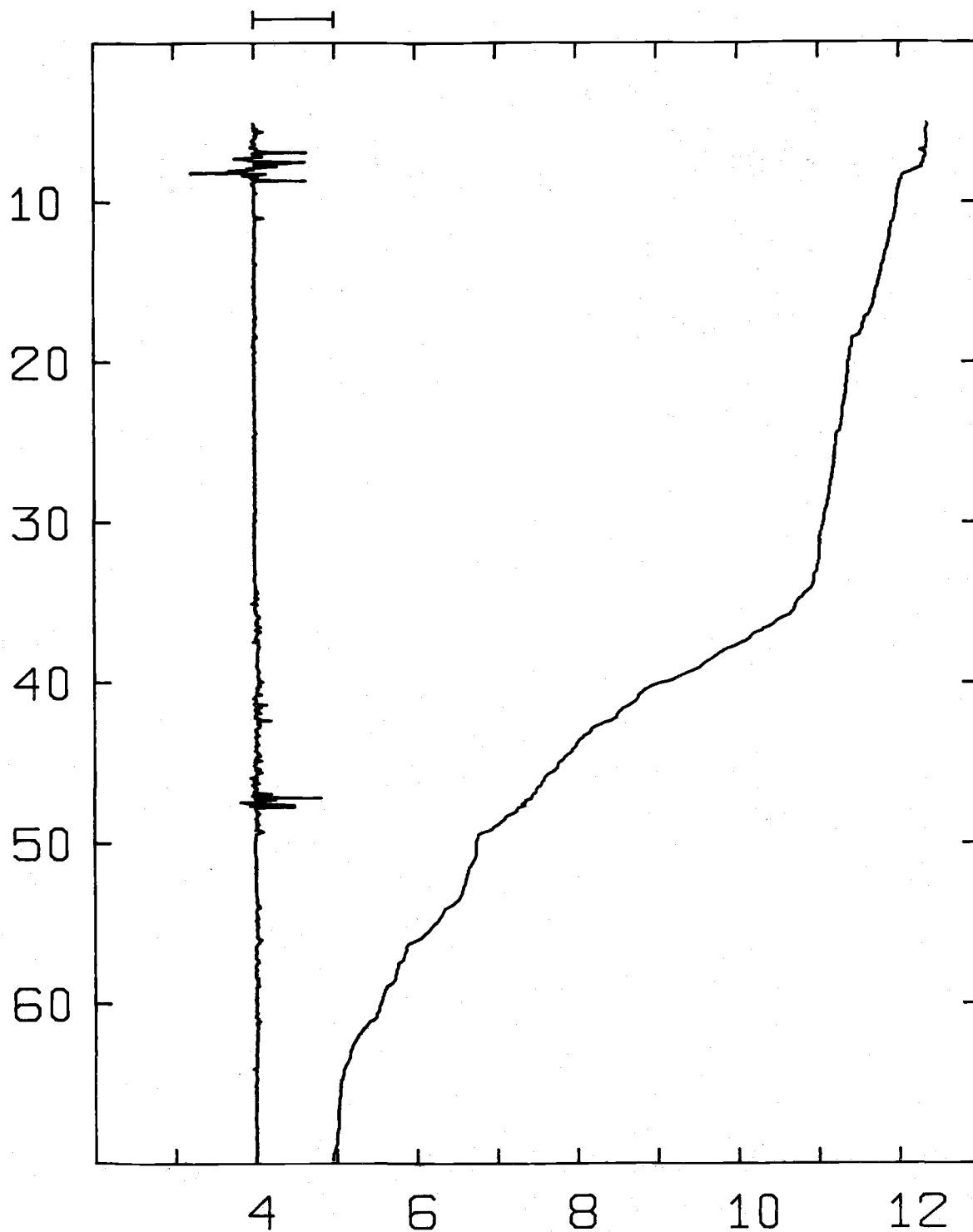


Figure 1. Bridge observations from the R/V OCEANOGRAPHER during MILE. Surface shear stress was calculated from the bulk formula $\tau = \rho_a C_d \bar{U}_a^2$, where $C_d = 1.3 \times 10^{-3}$.

Temperature Microstructure Profiles

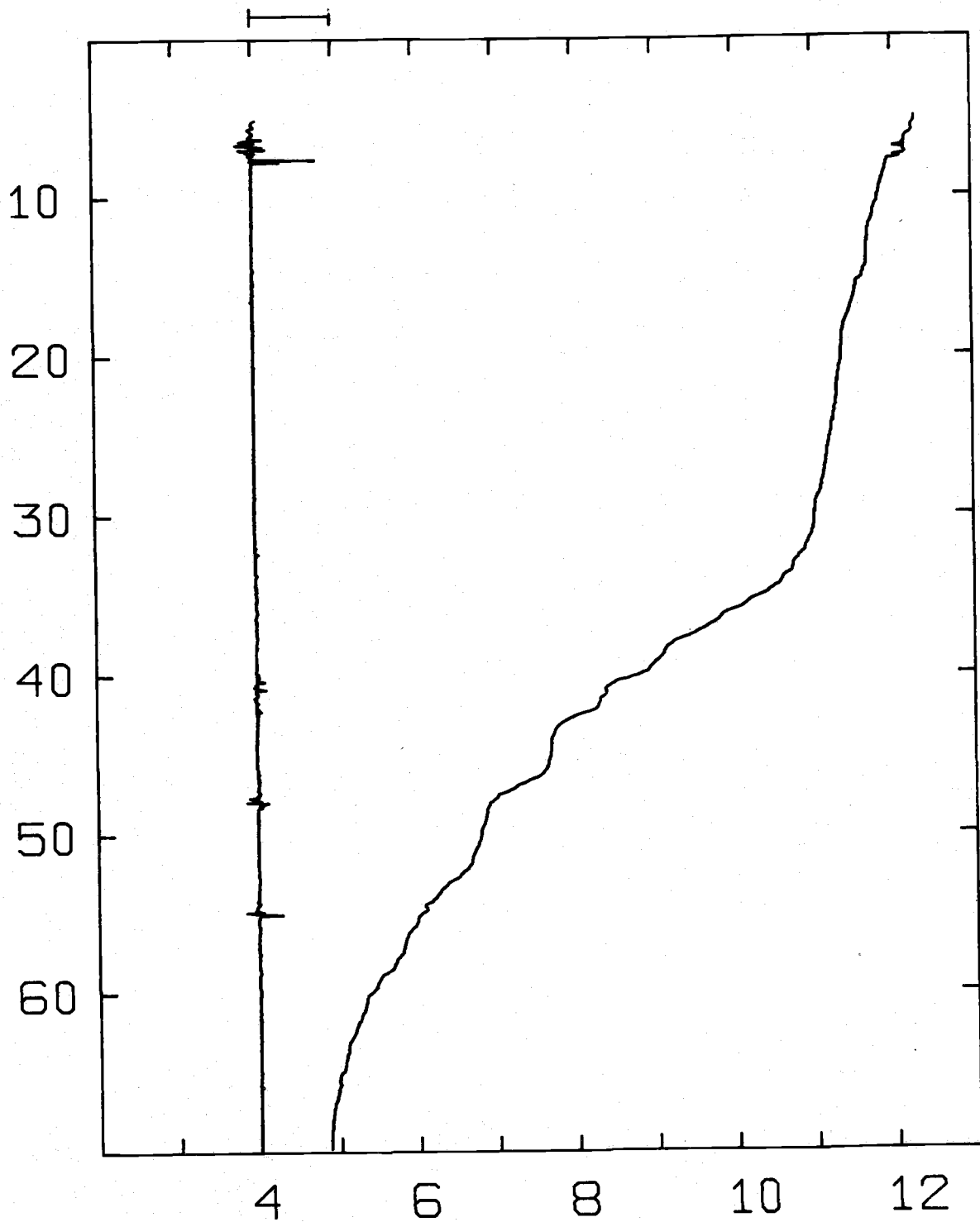
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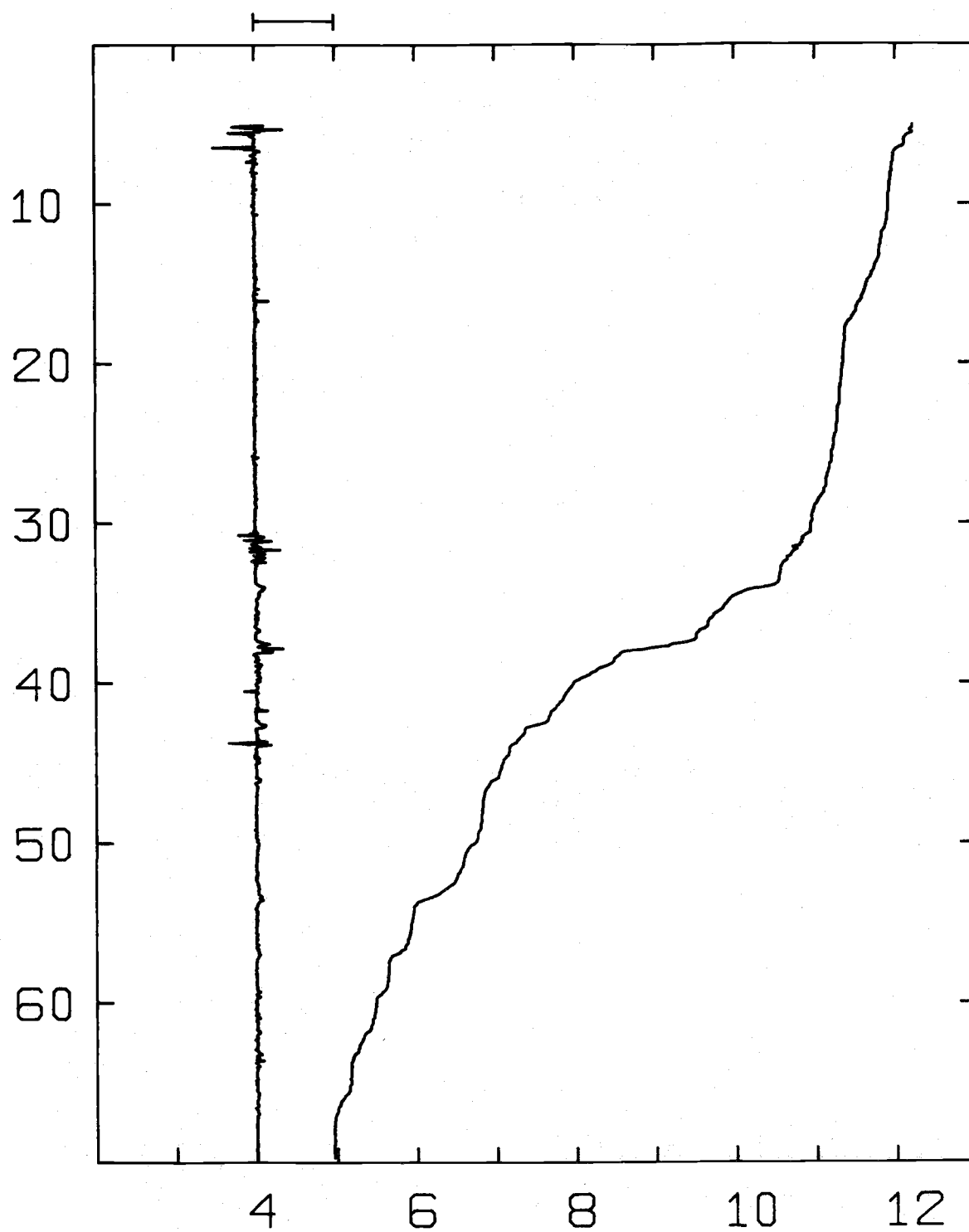
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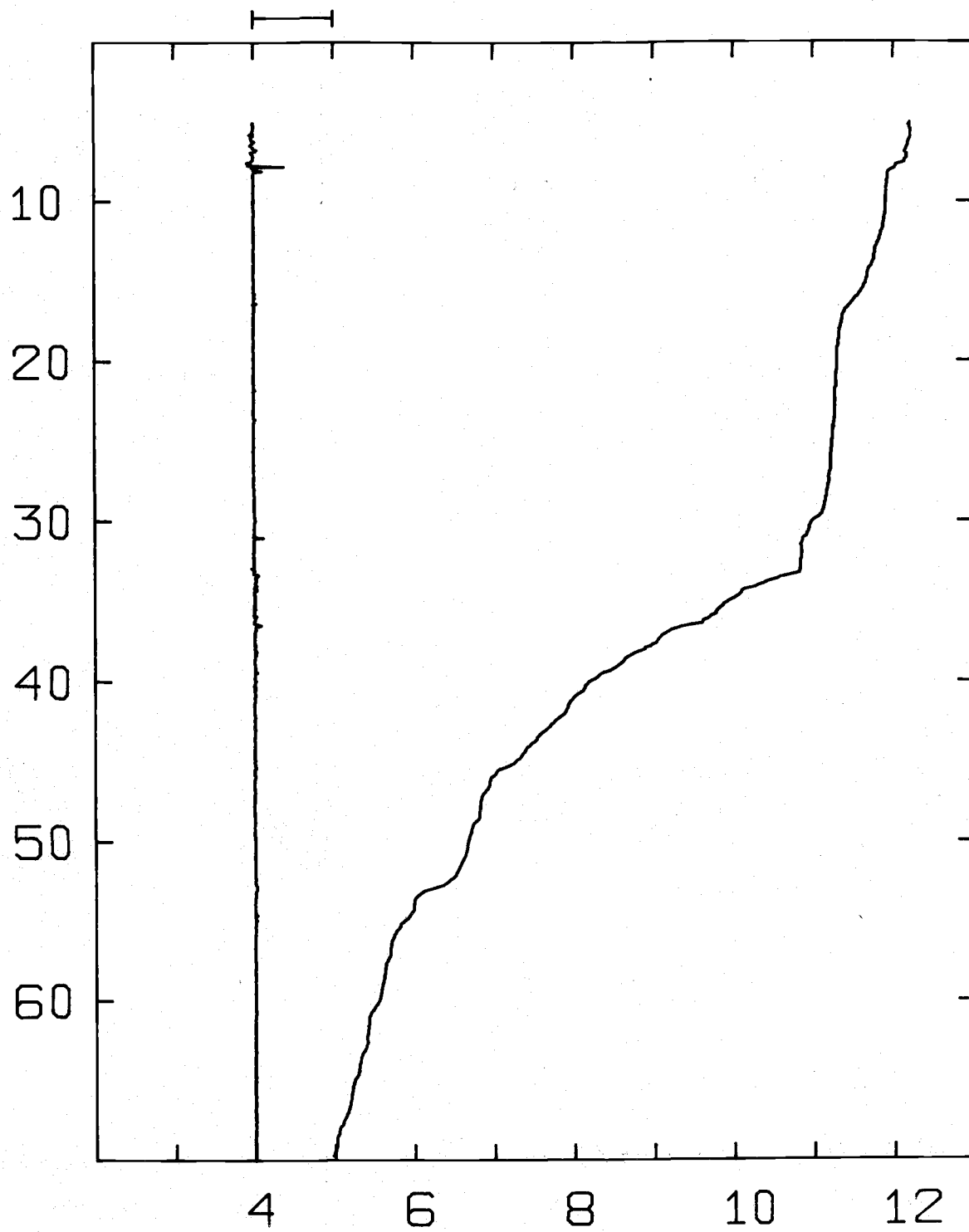
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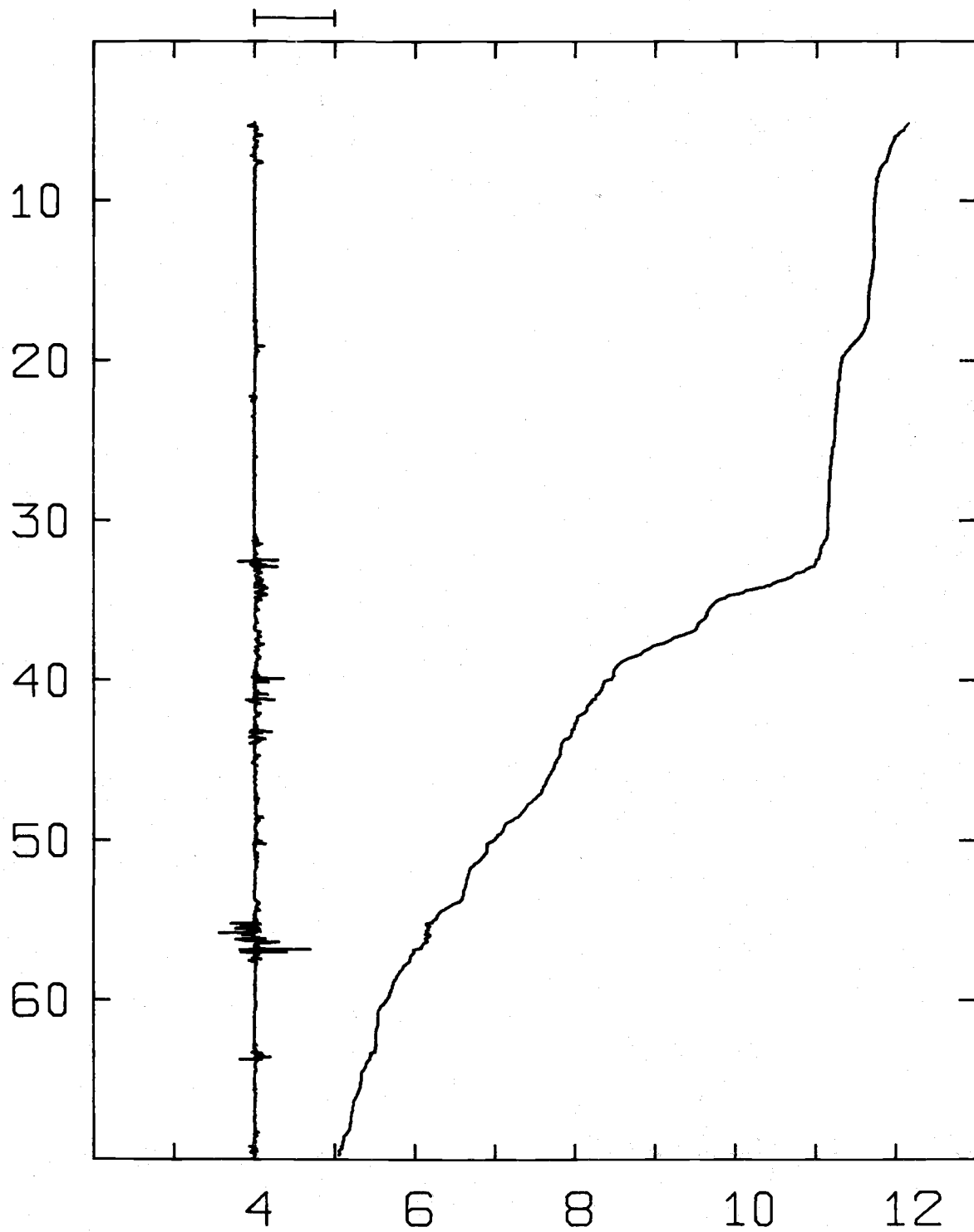
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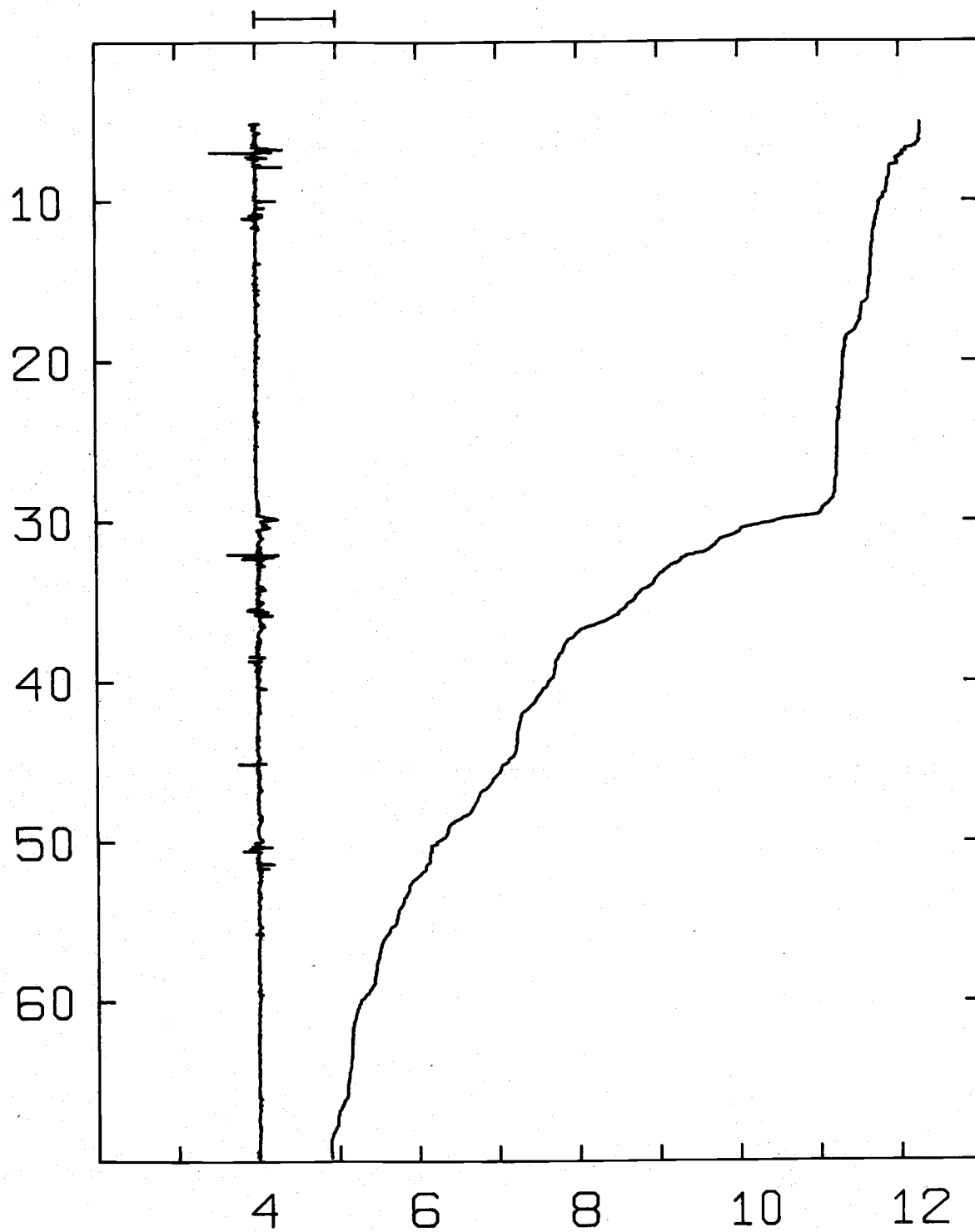
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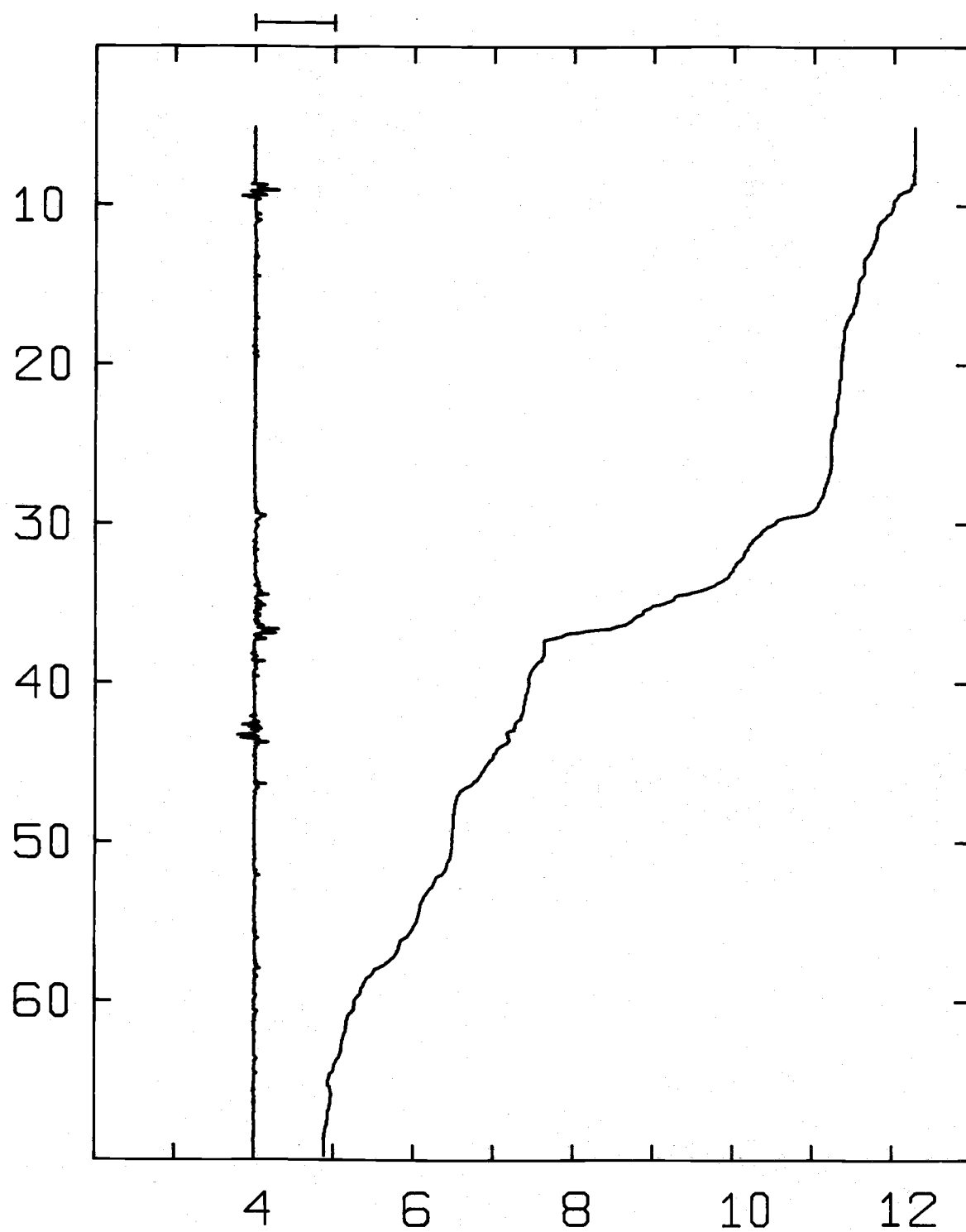
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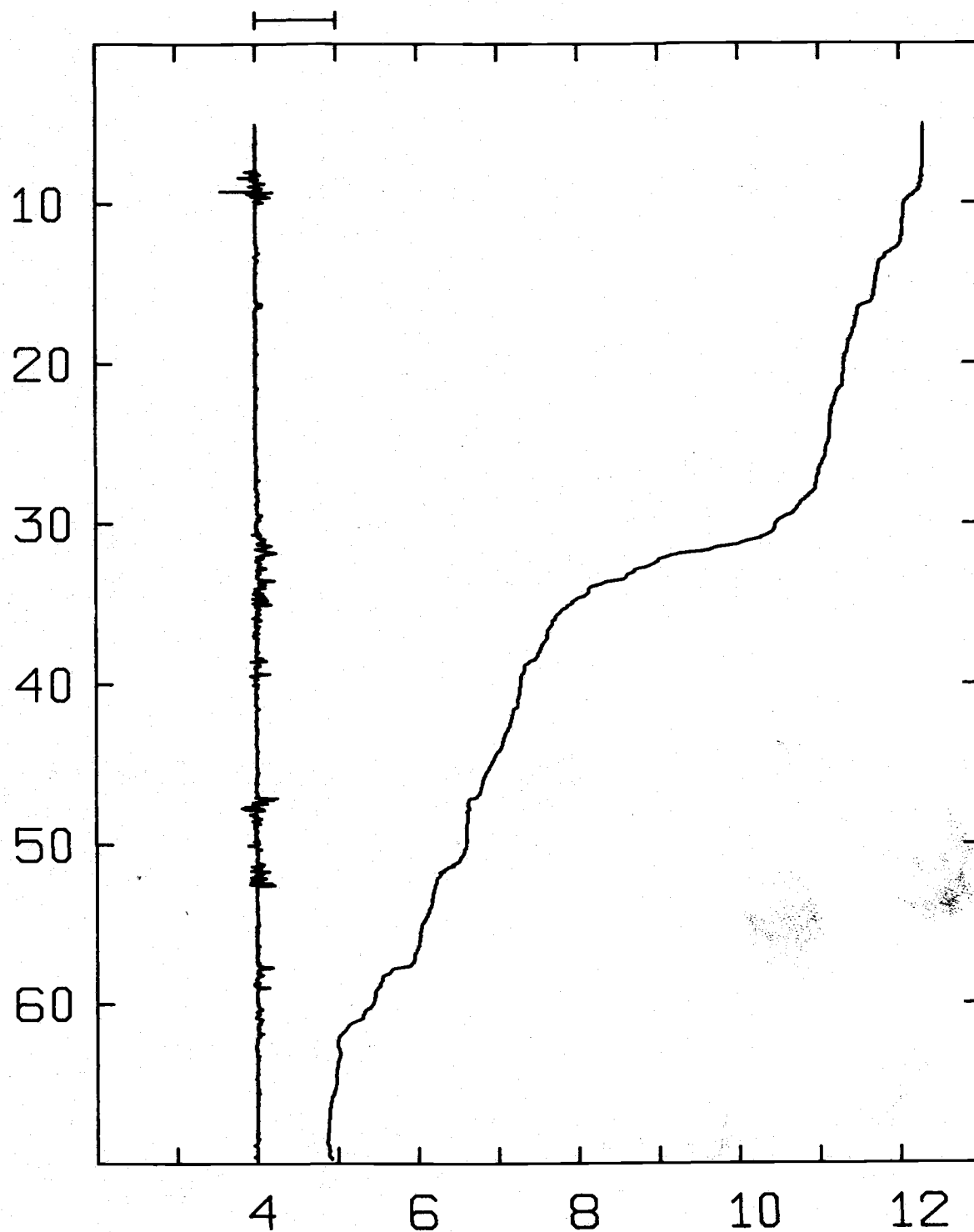
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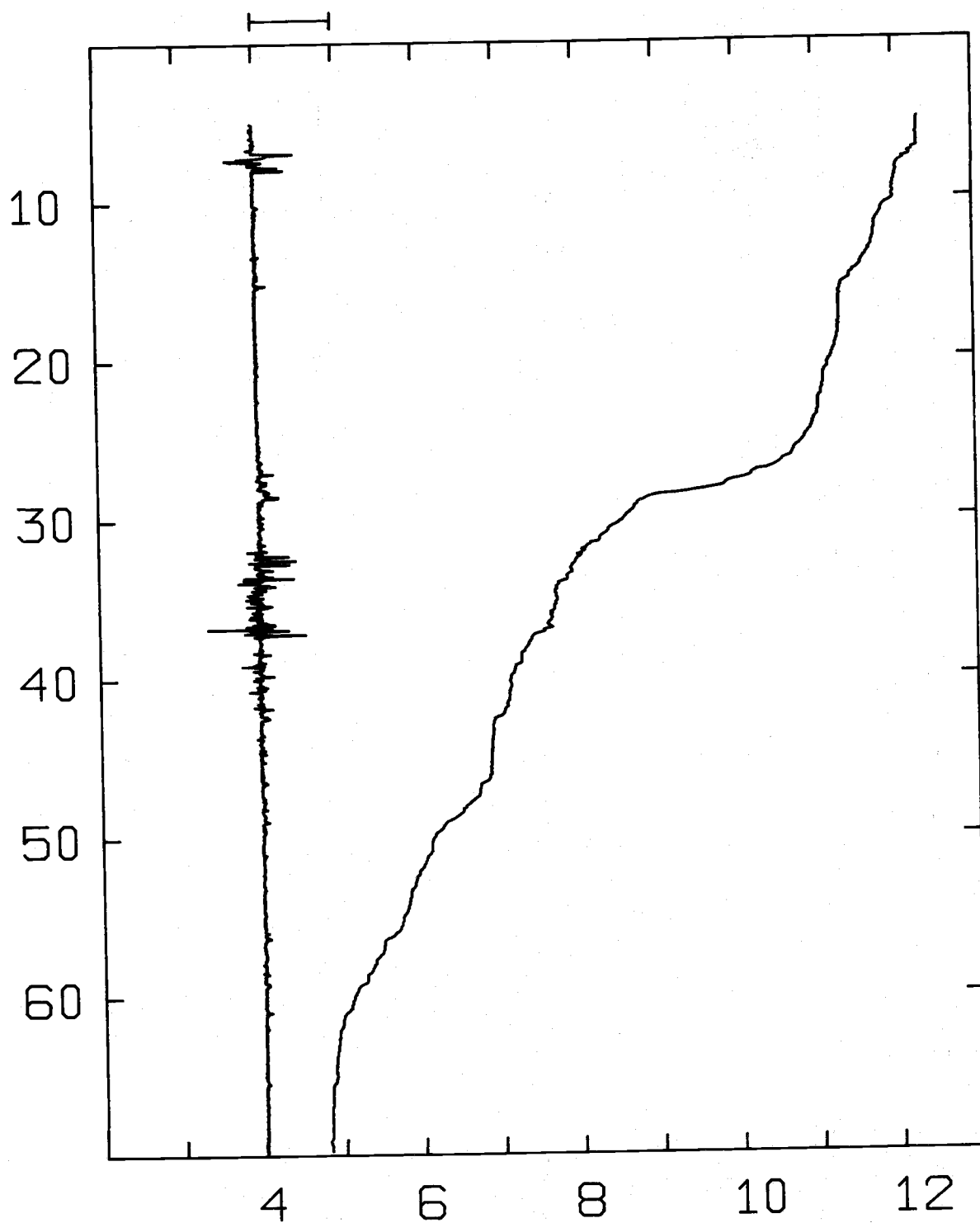
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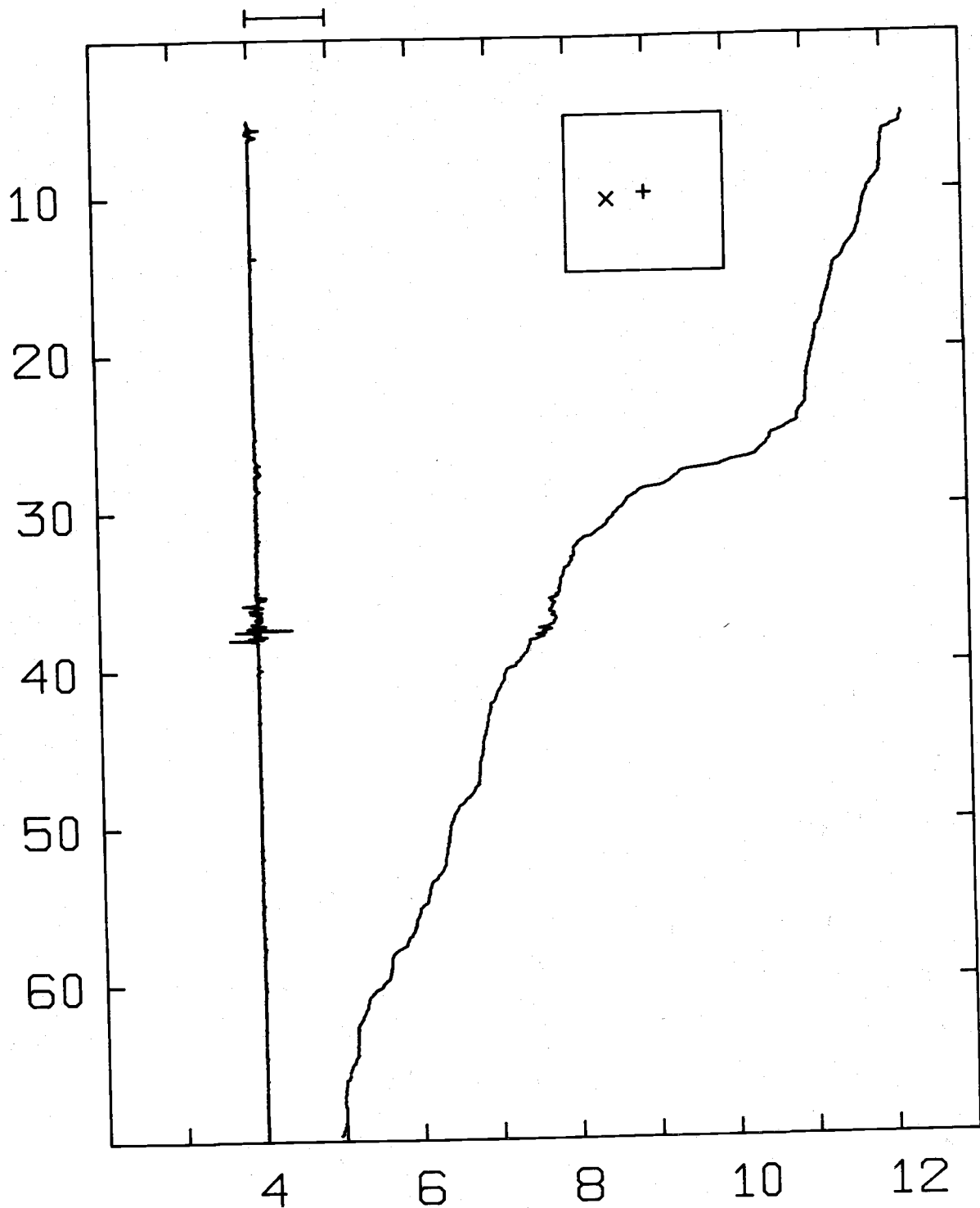
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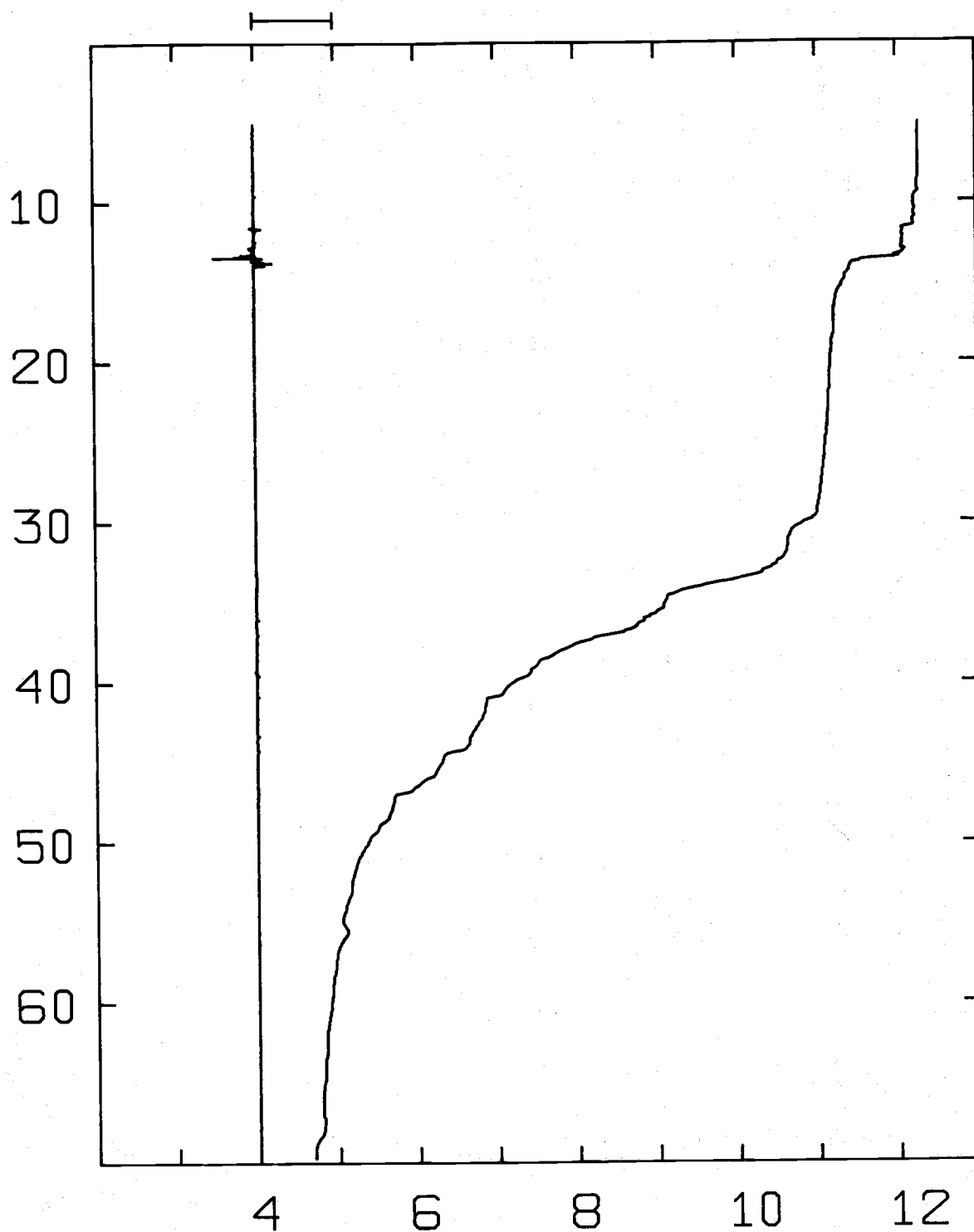
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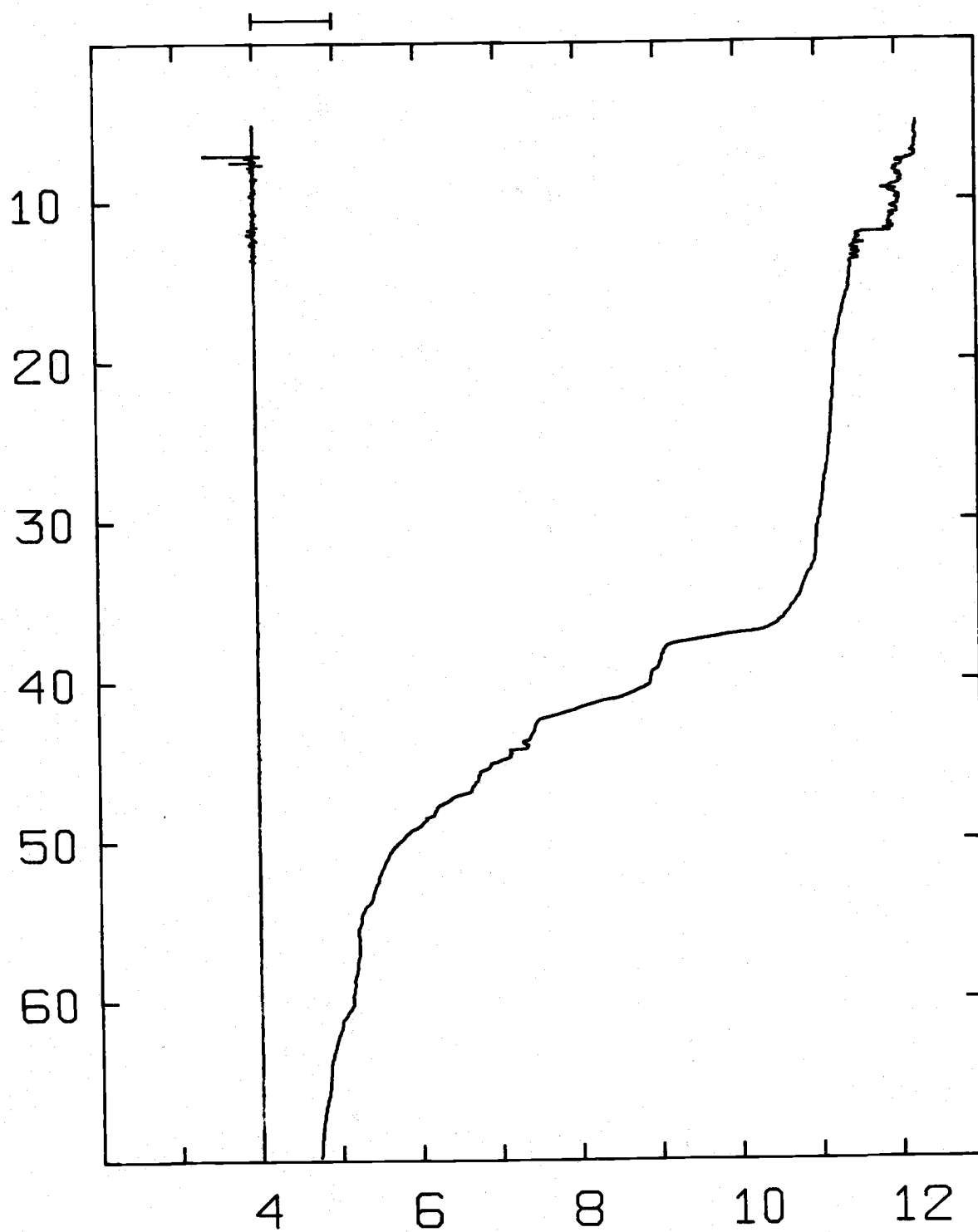
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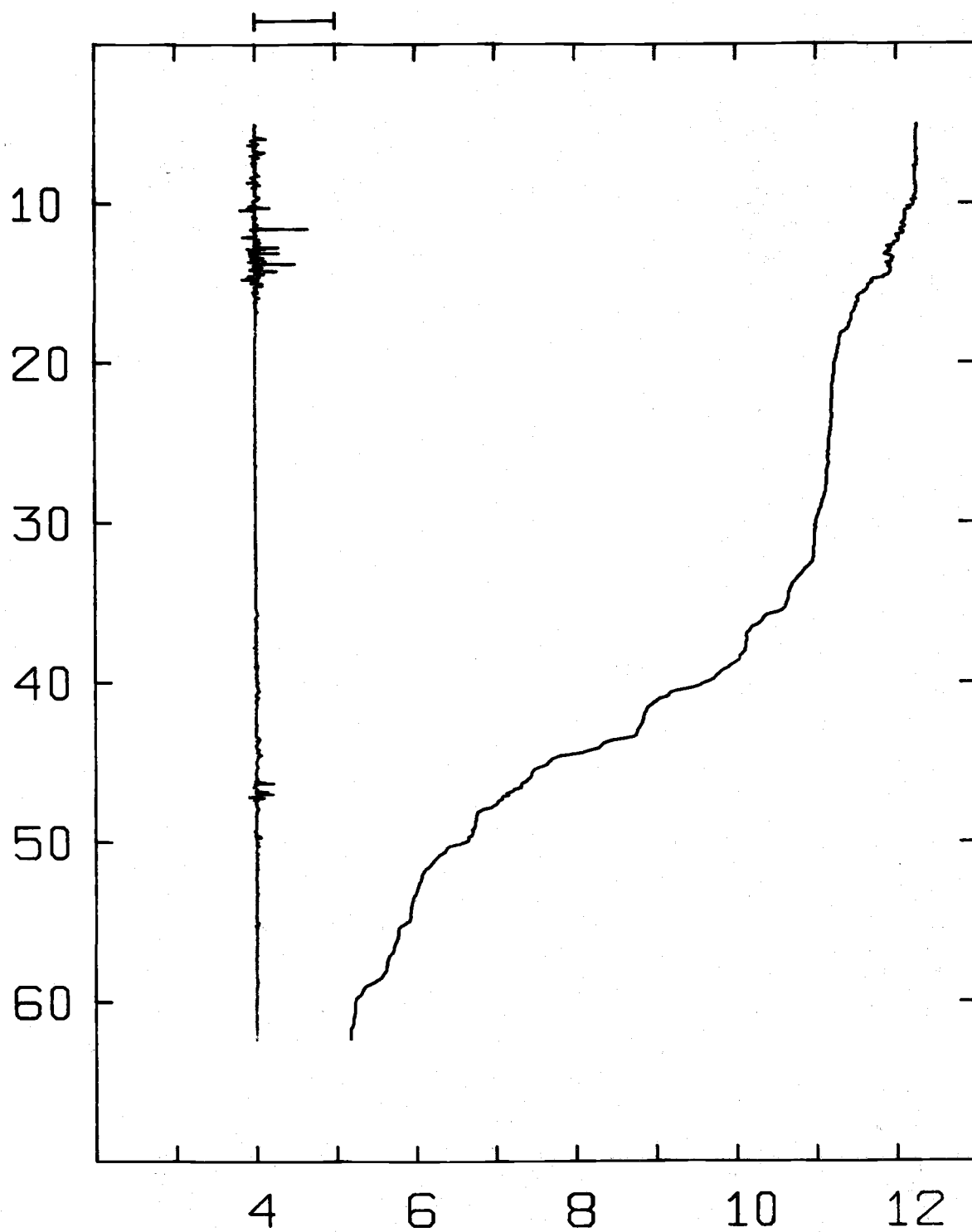
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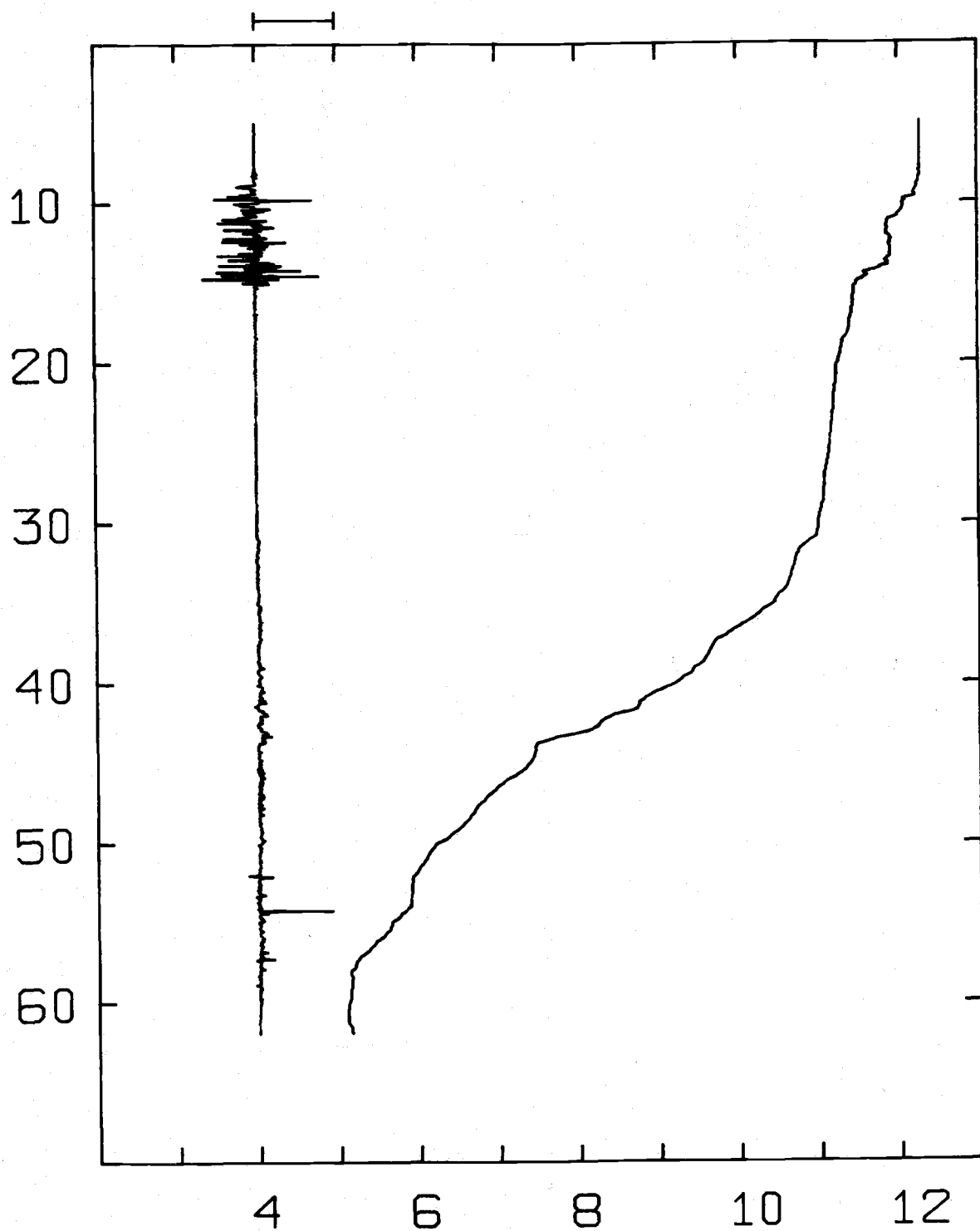
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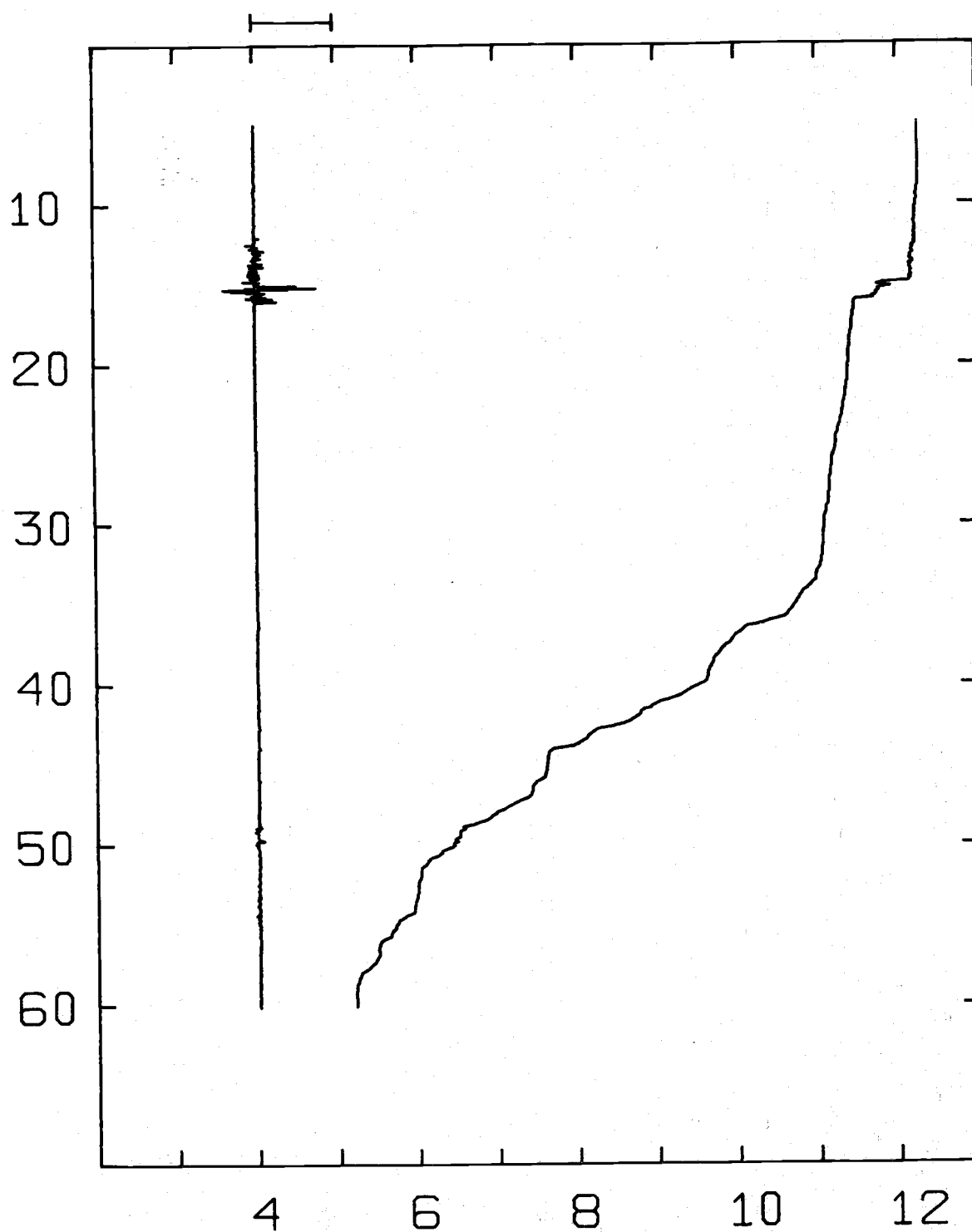
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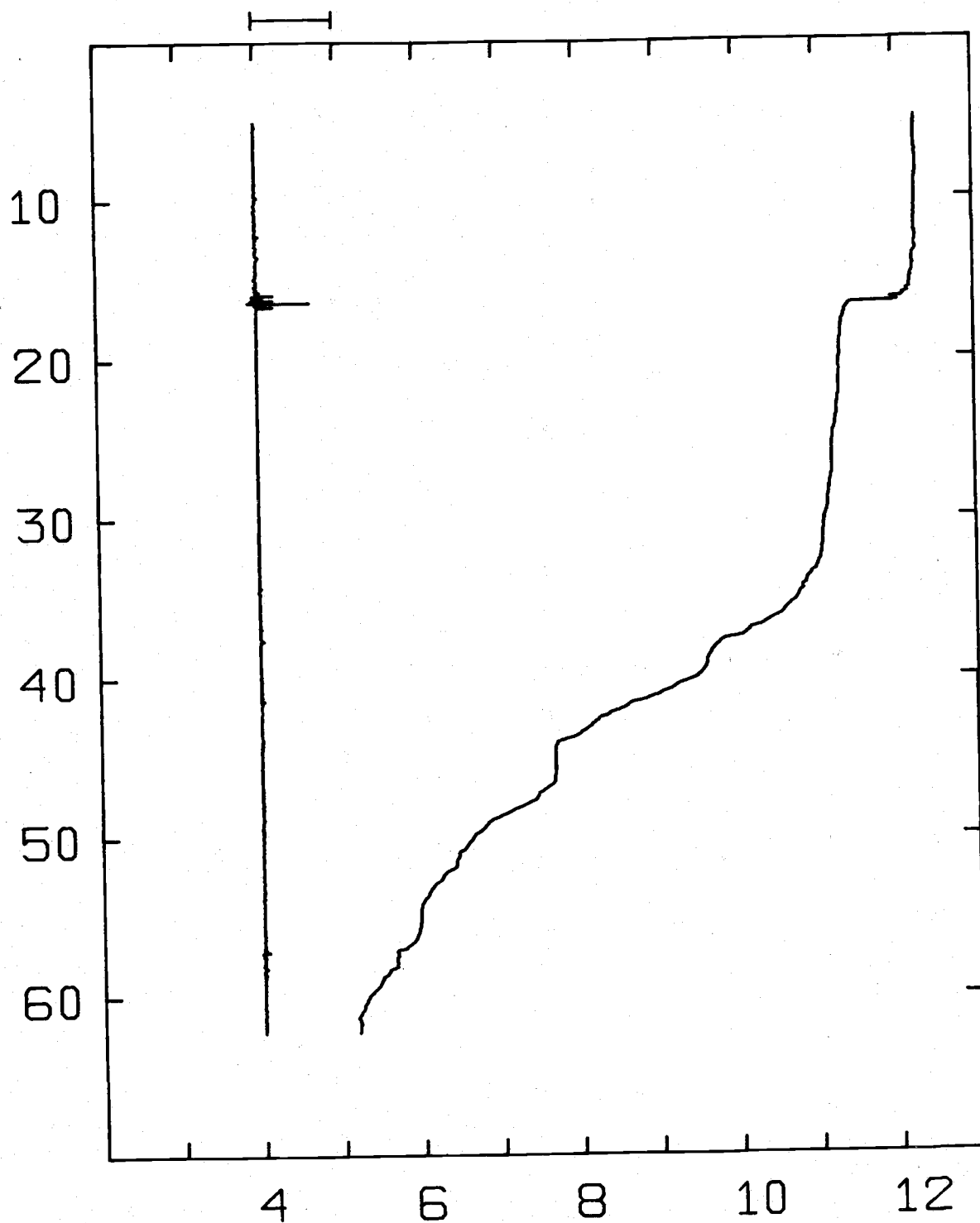
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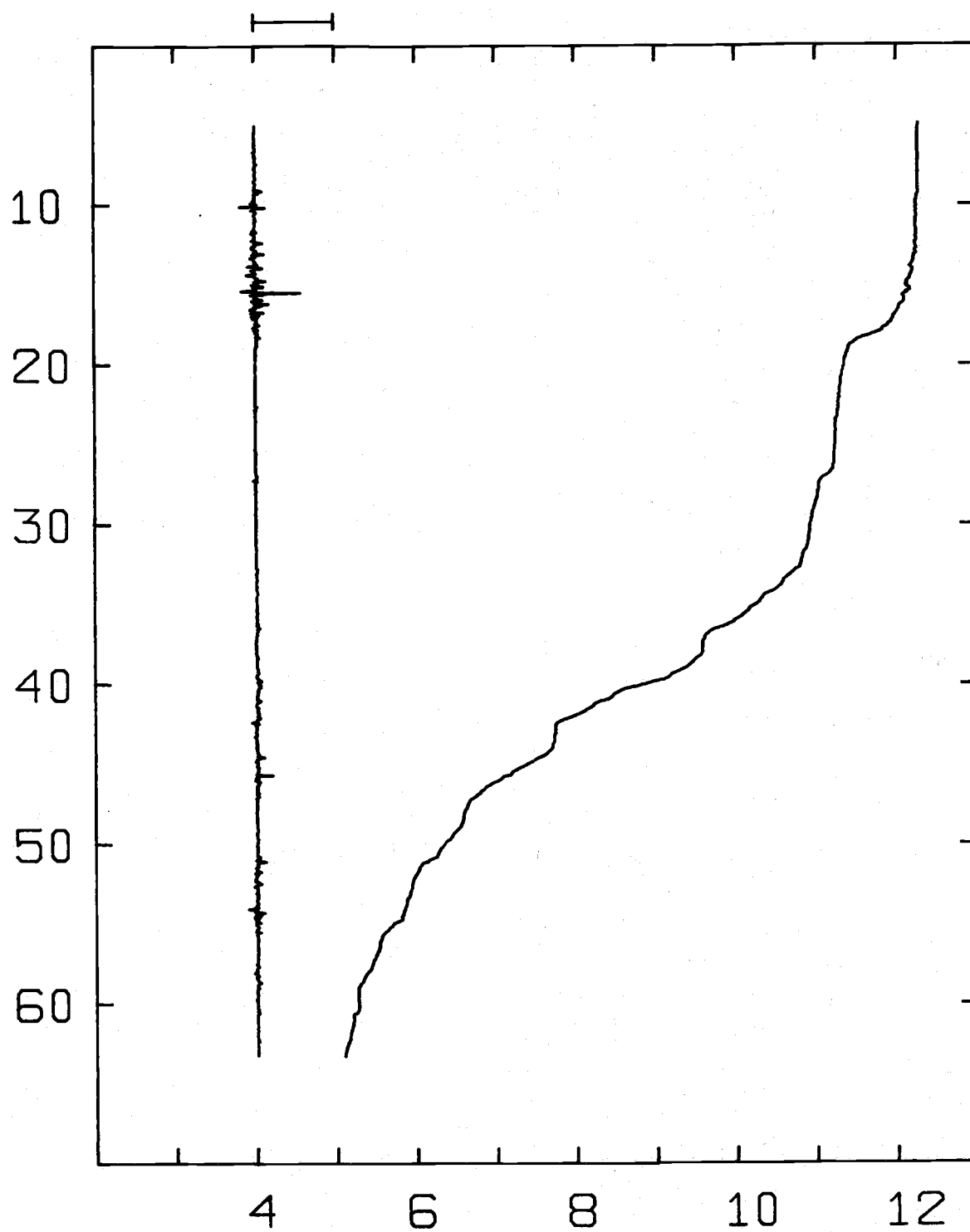
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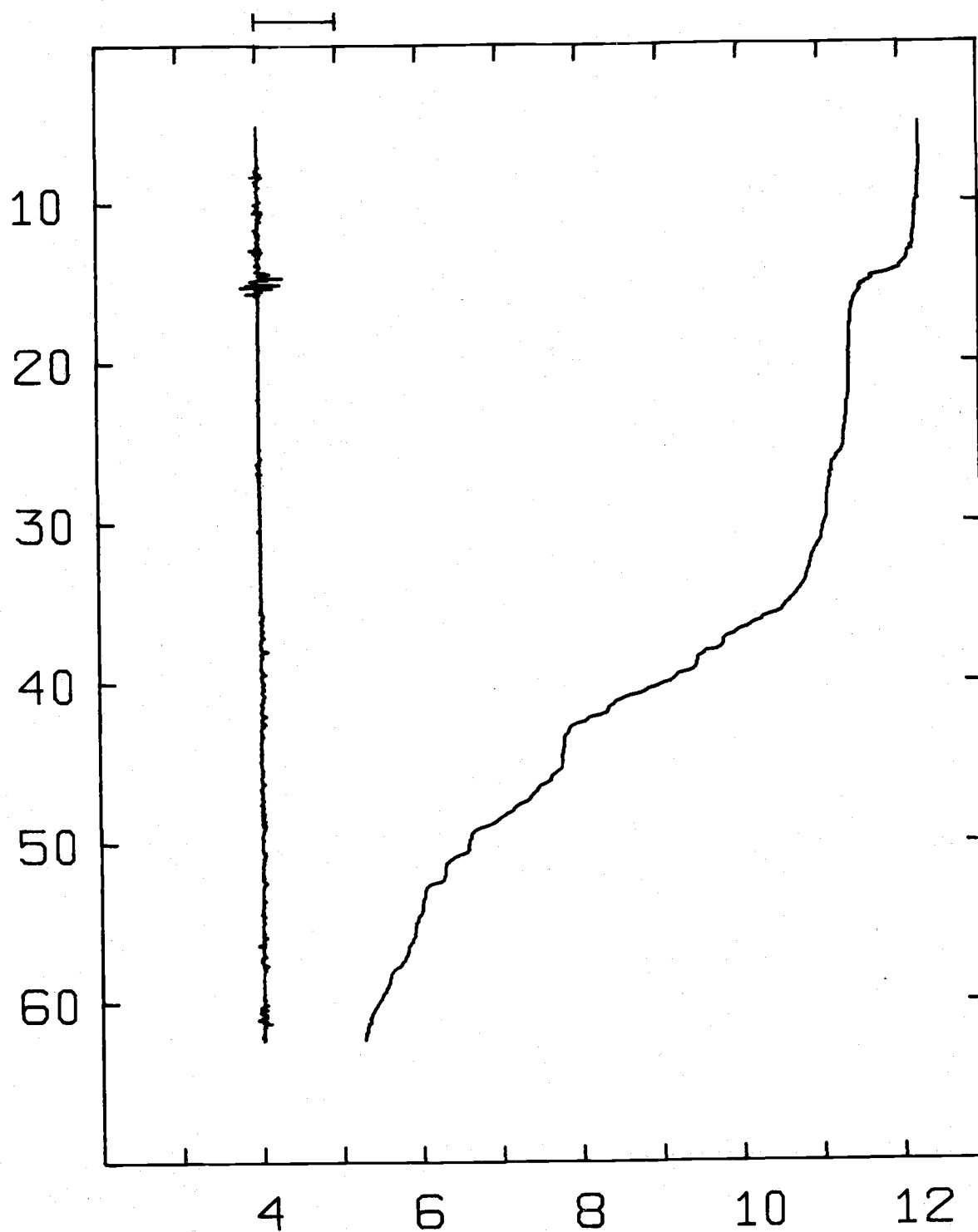
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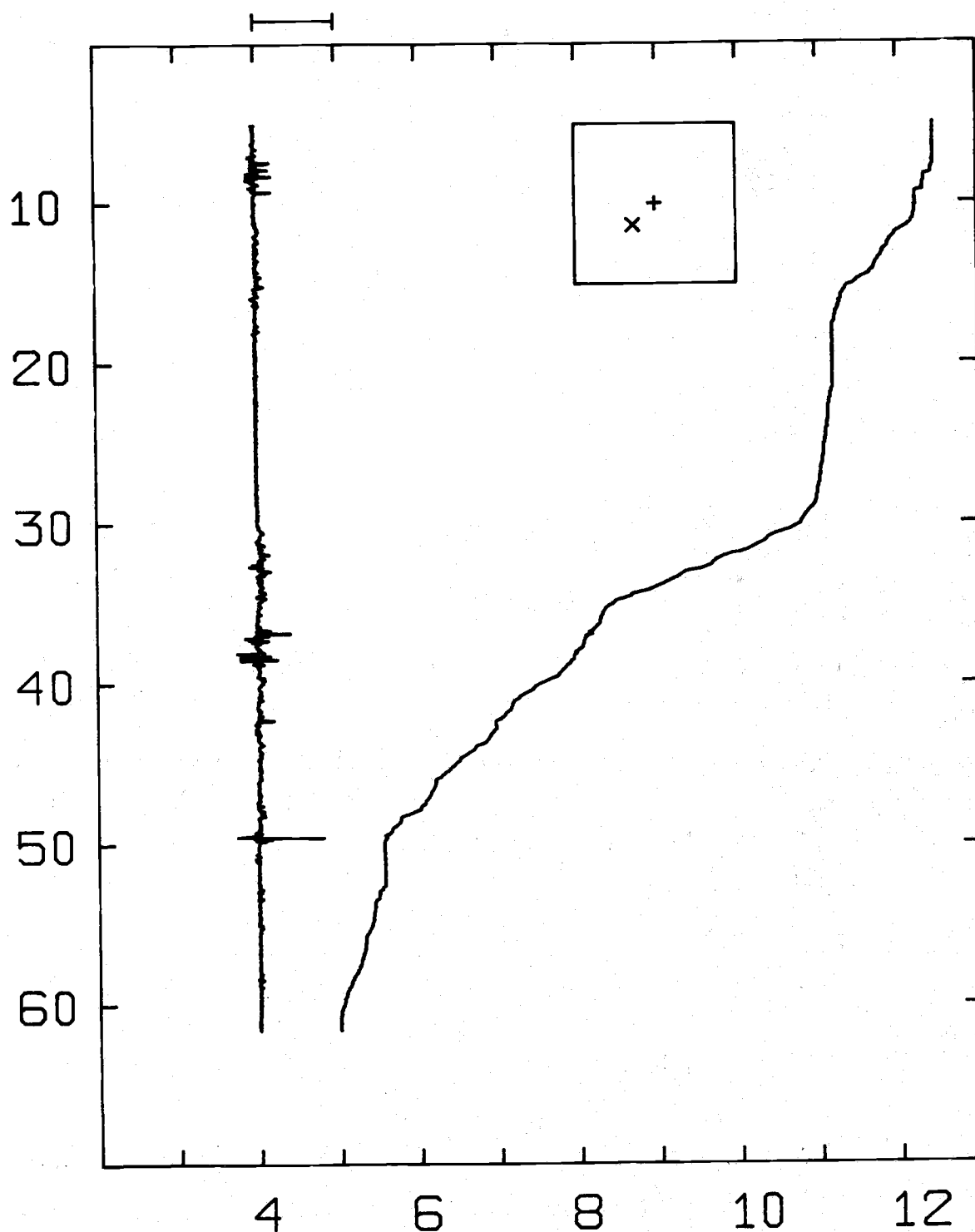
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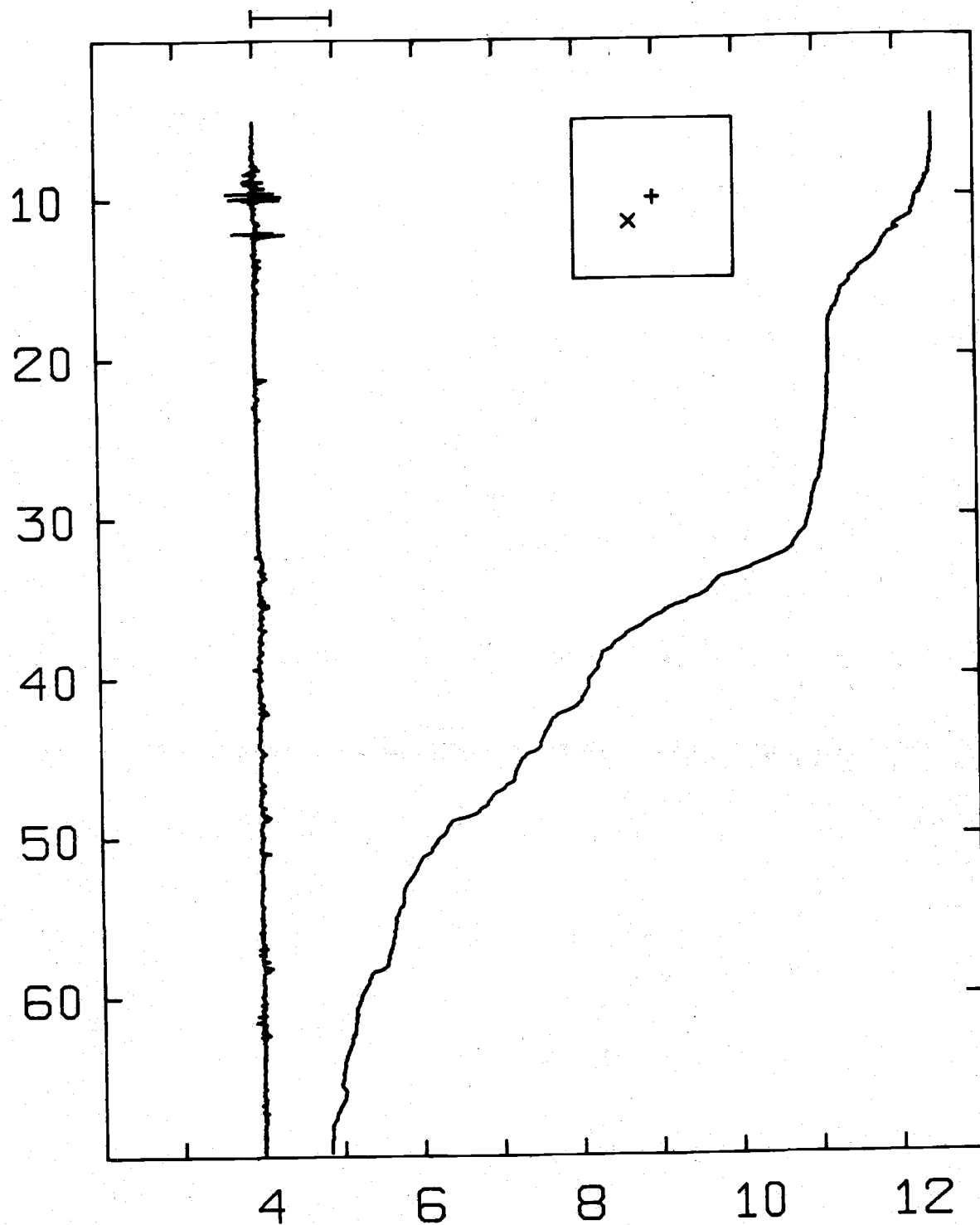
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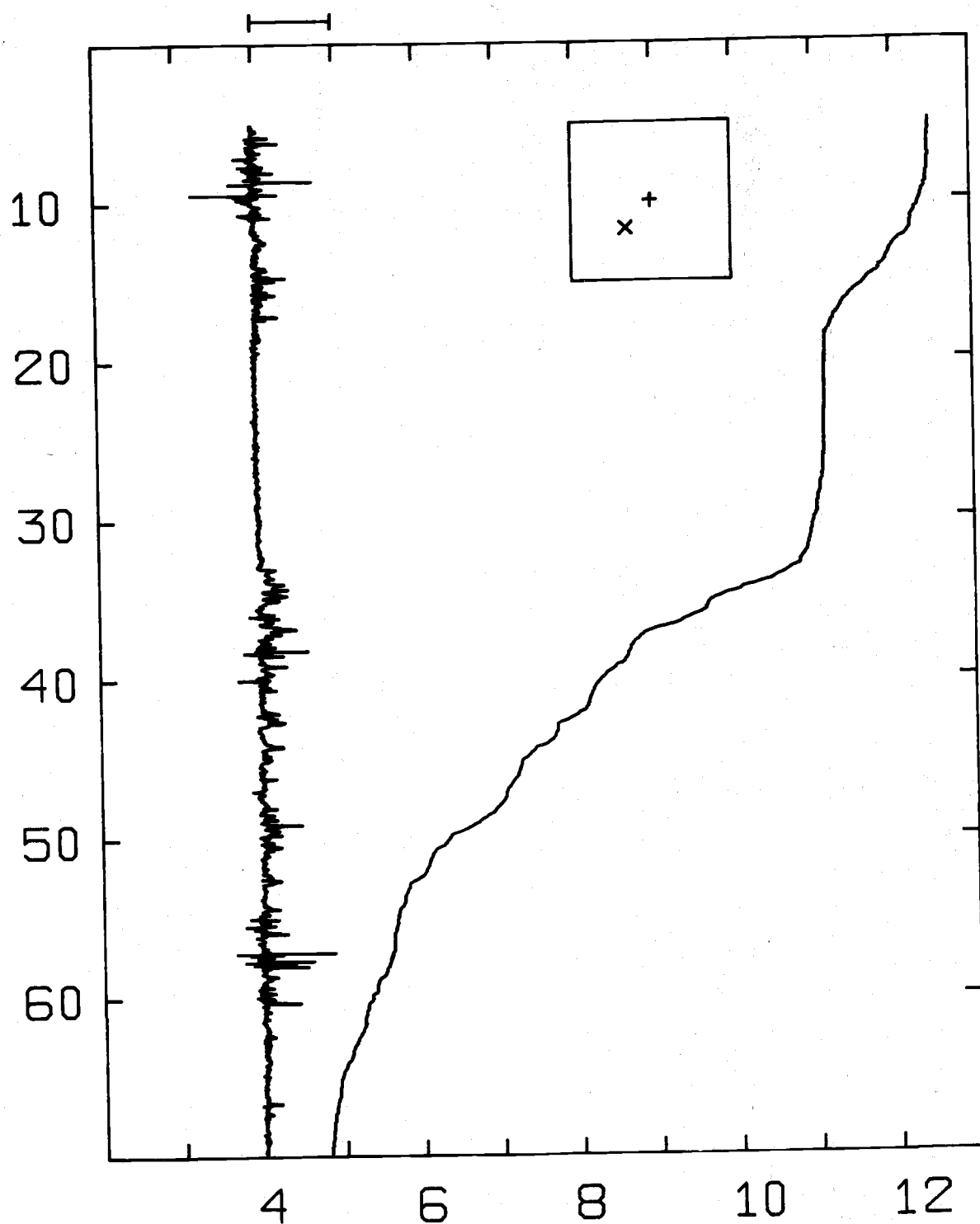
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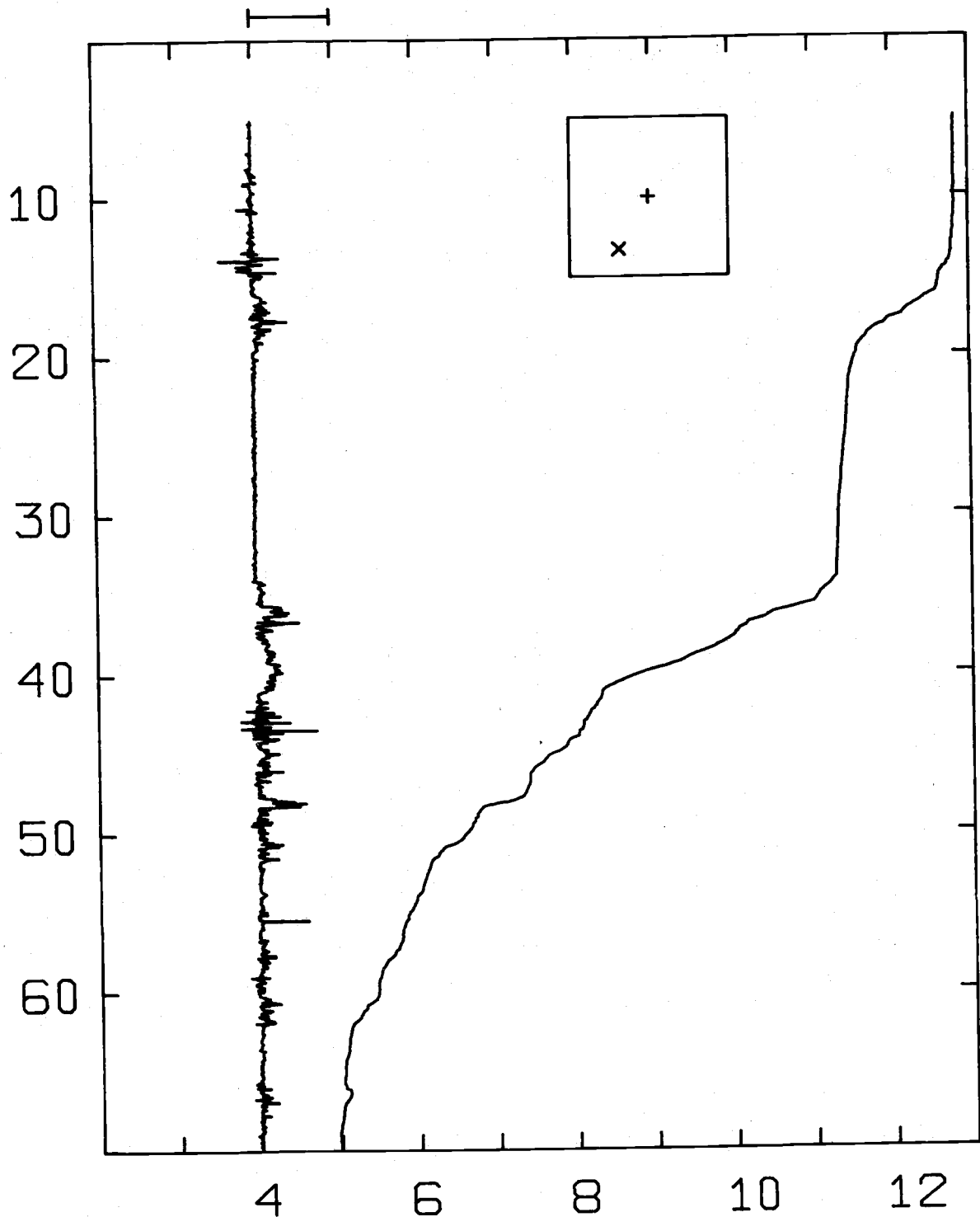
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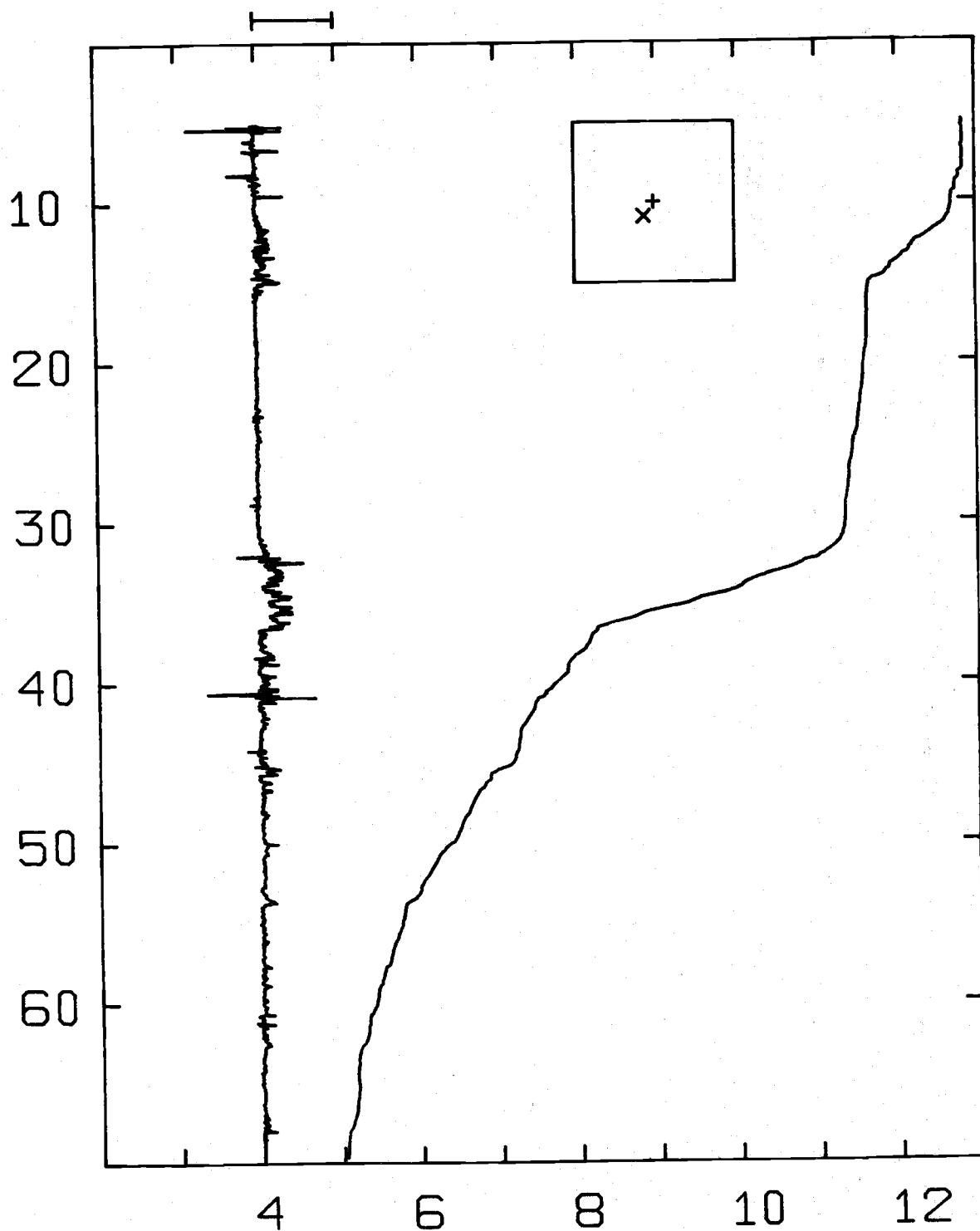
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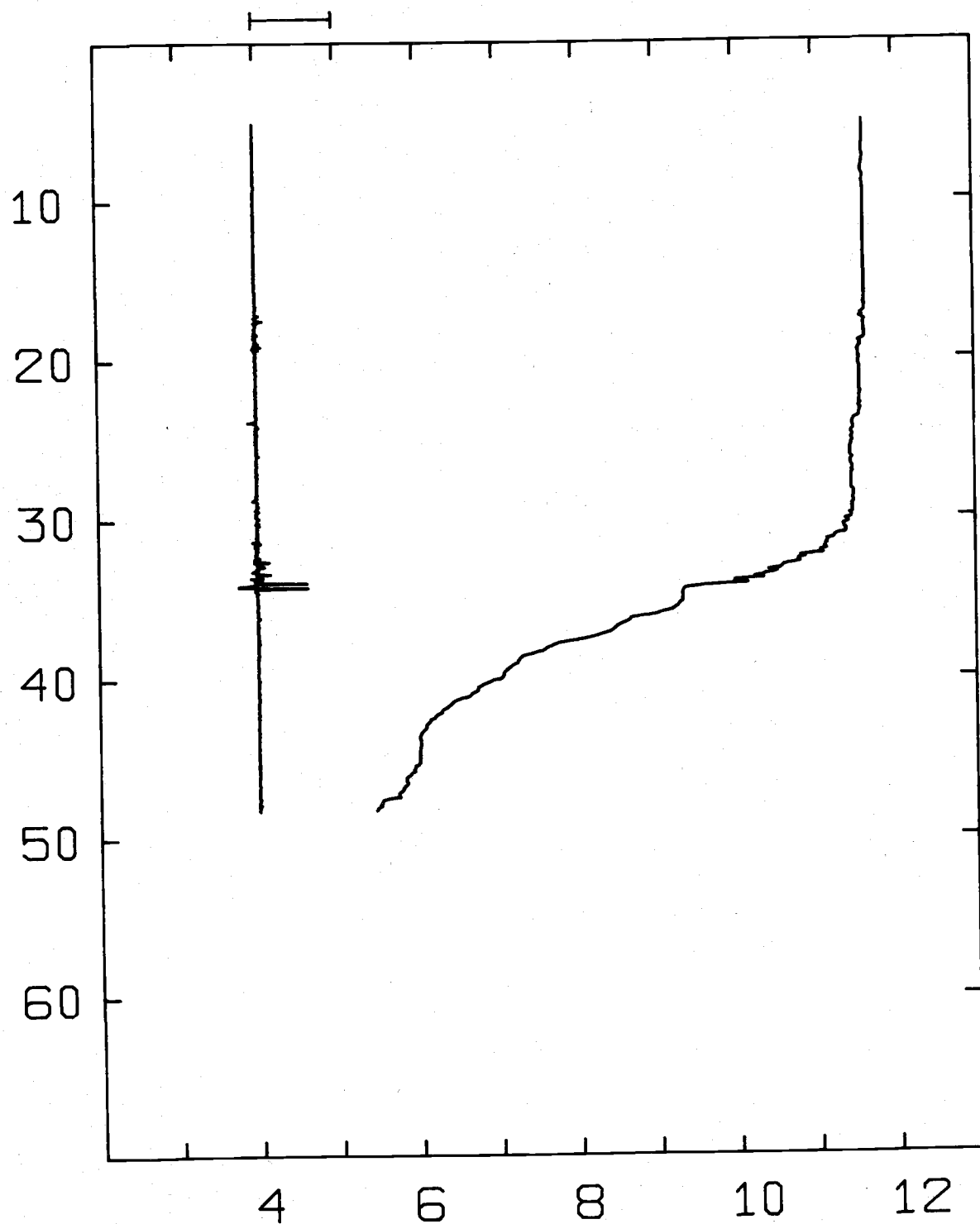
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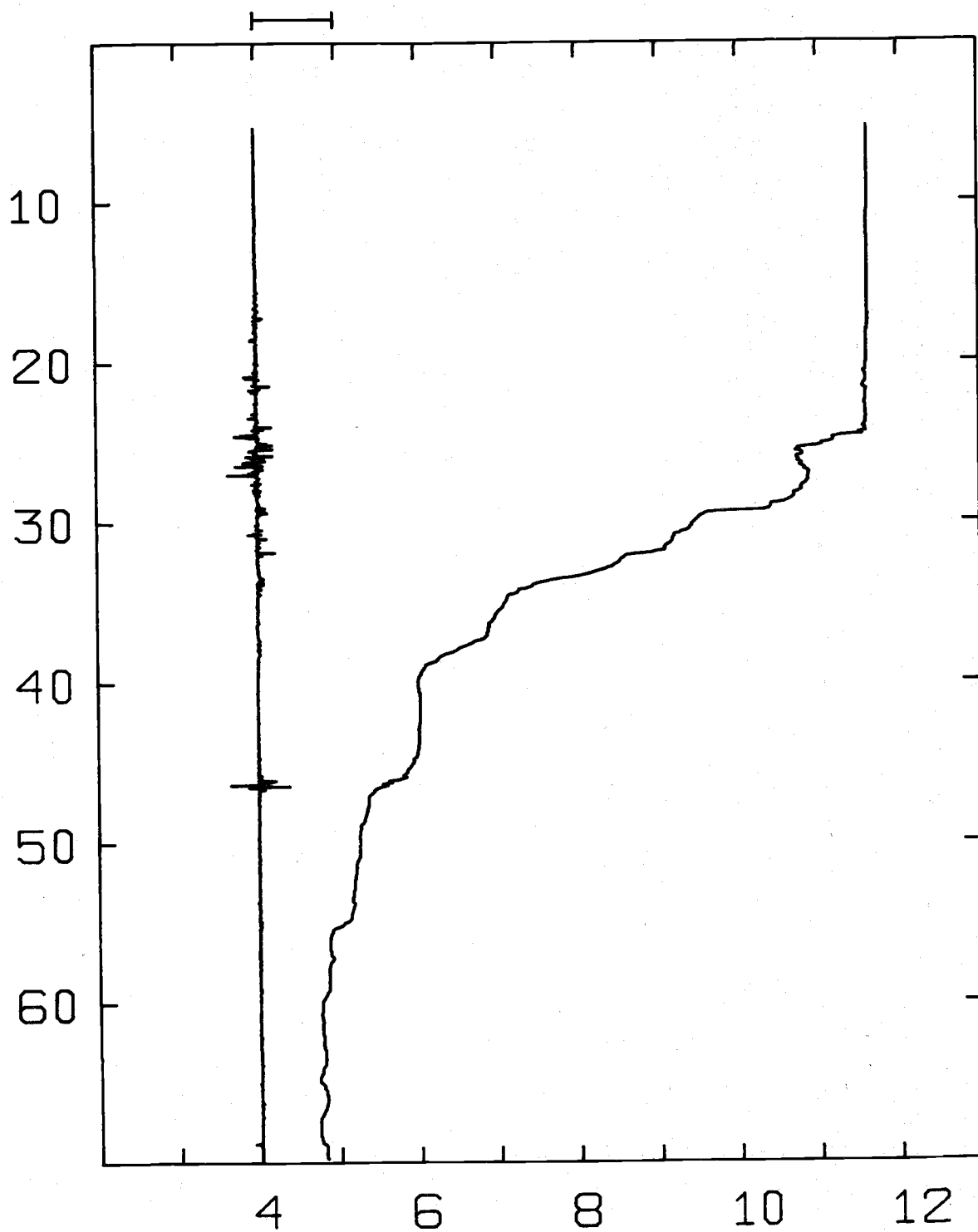
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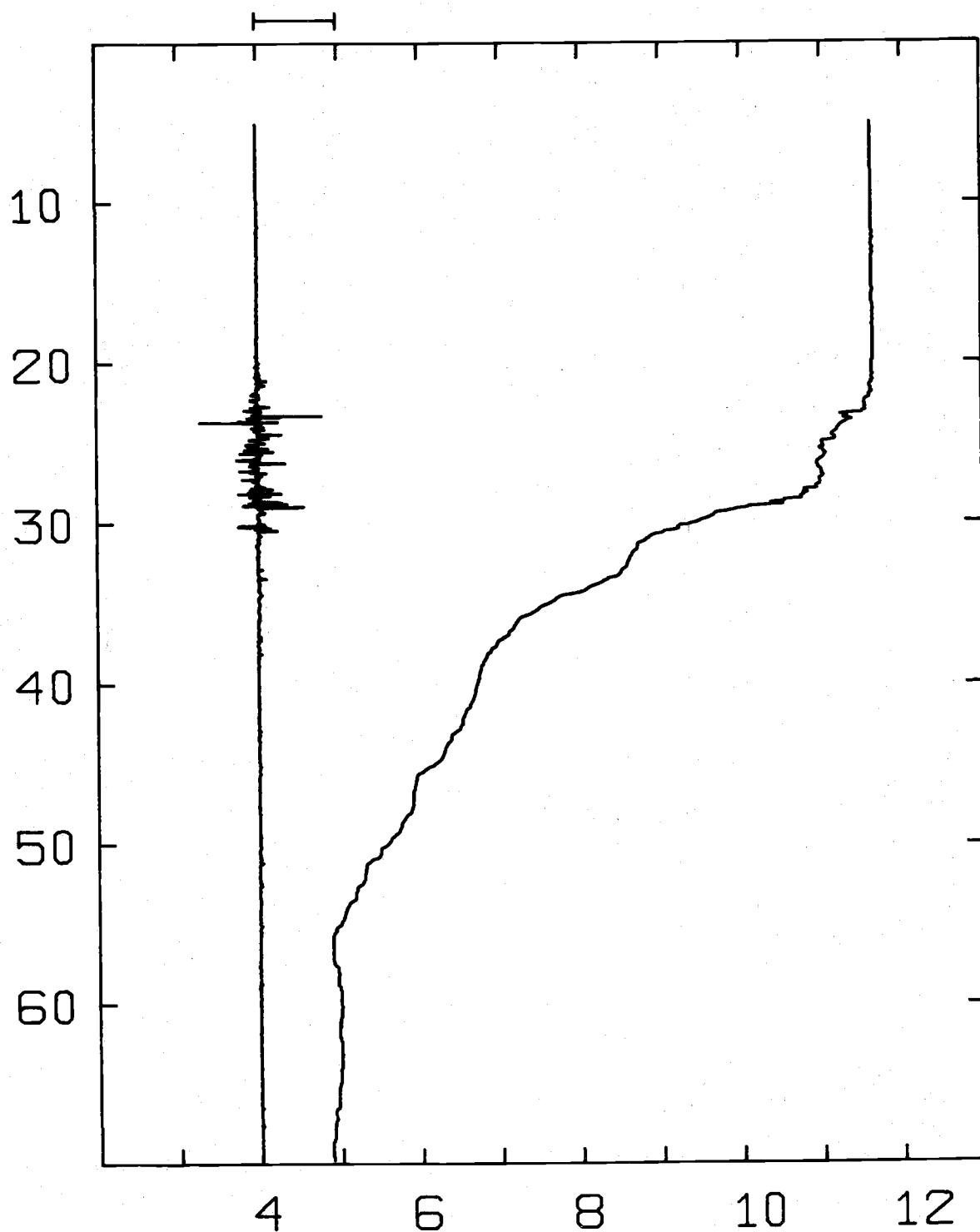
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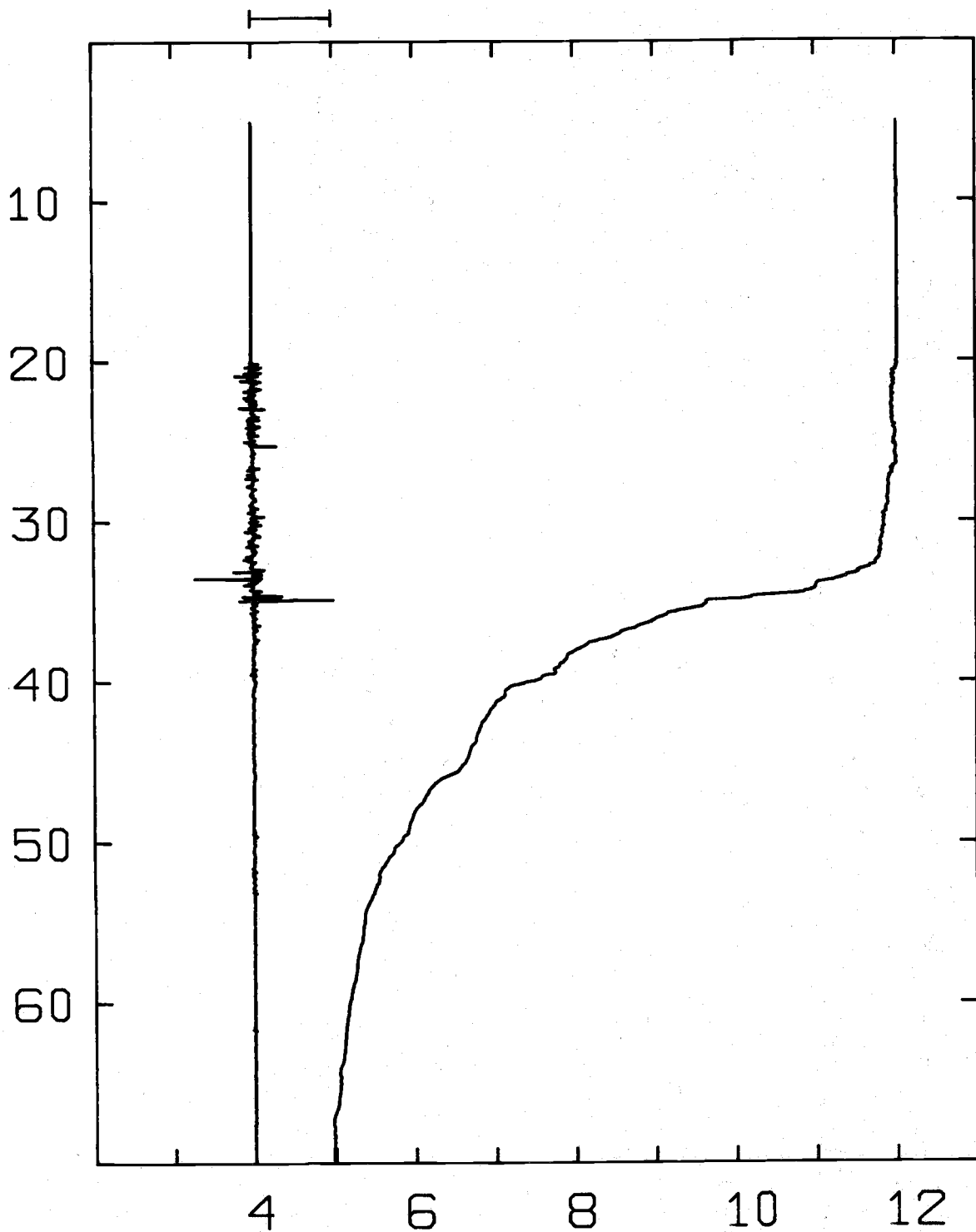
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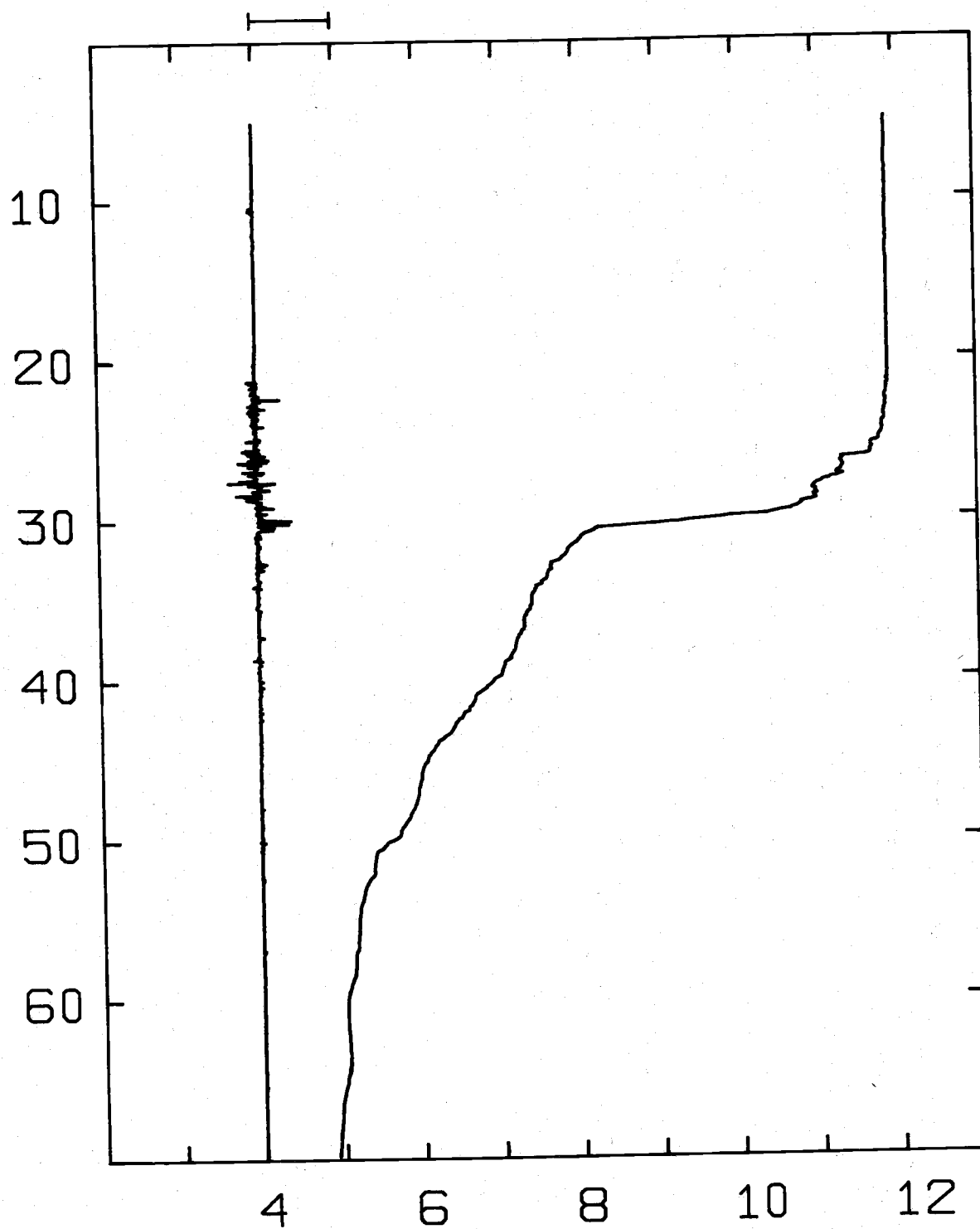
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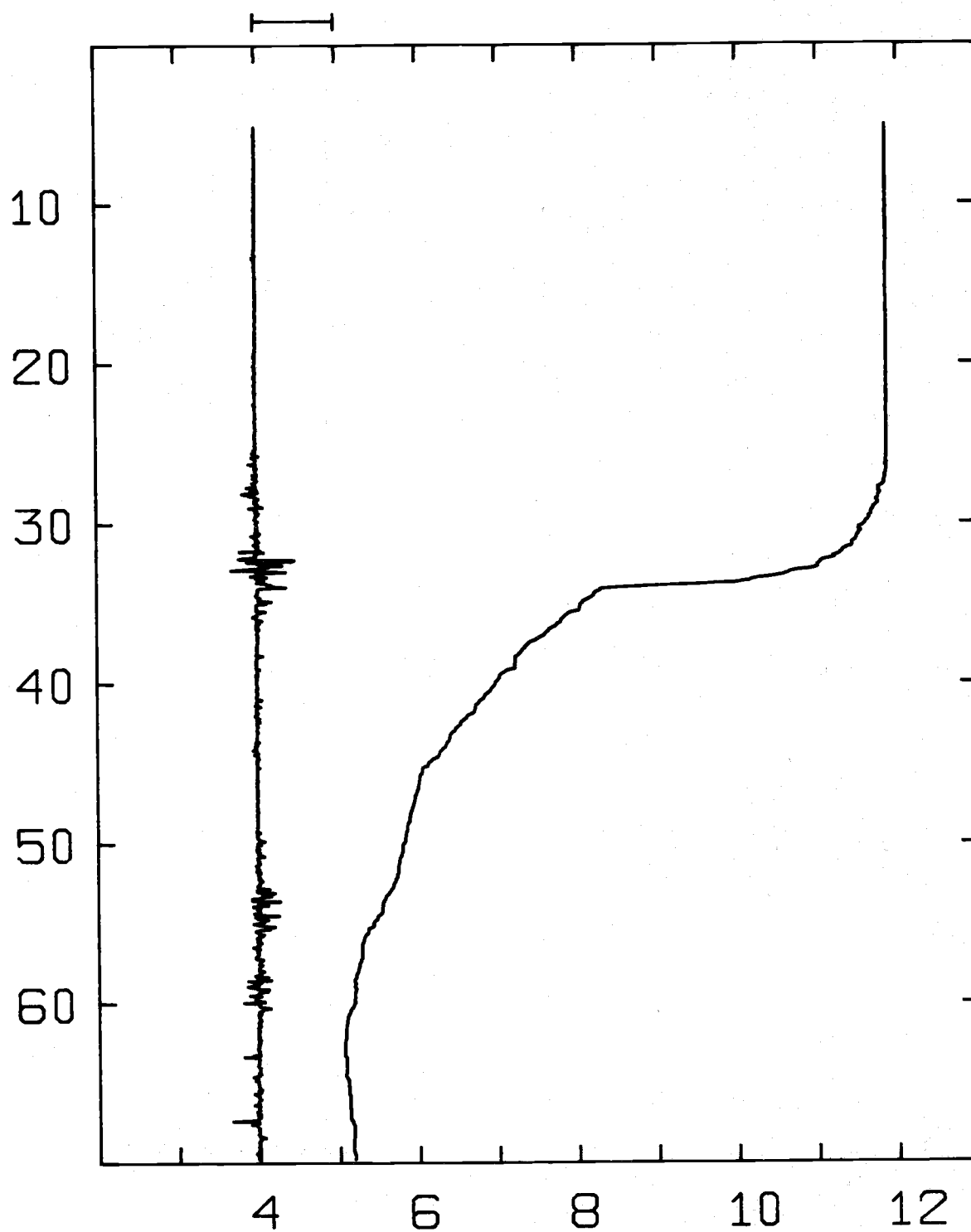
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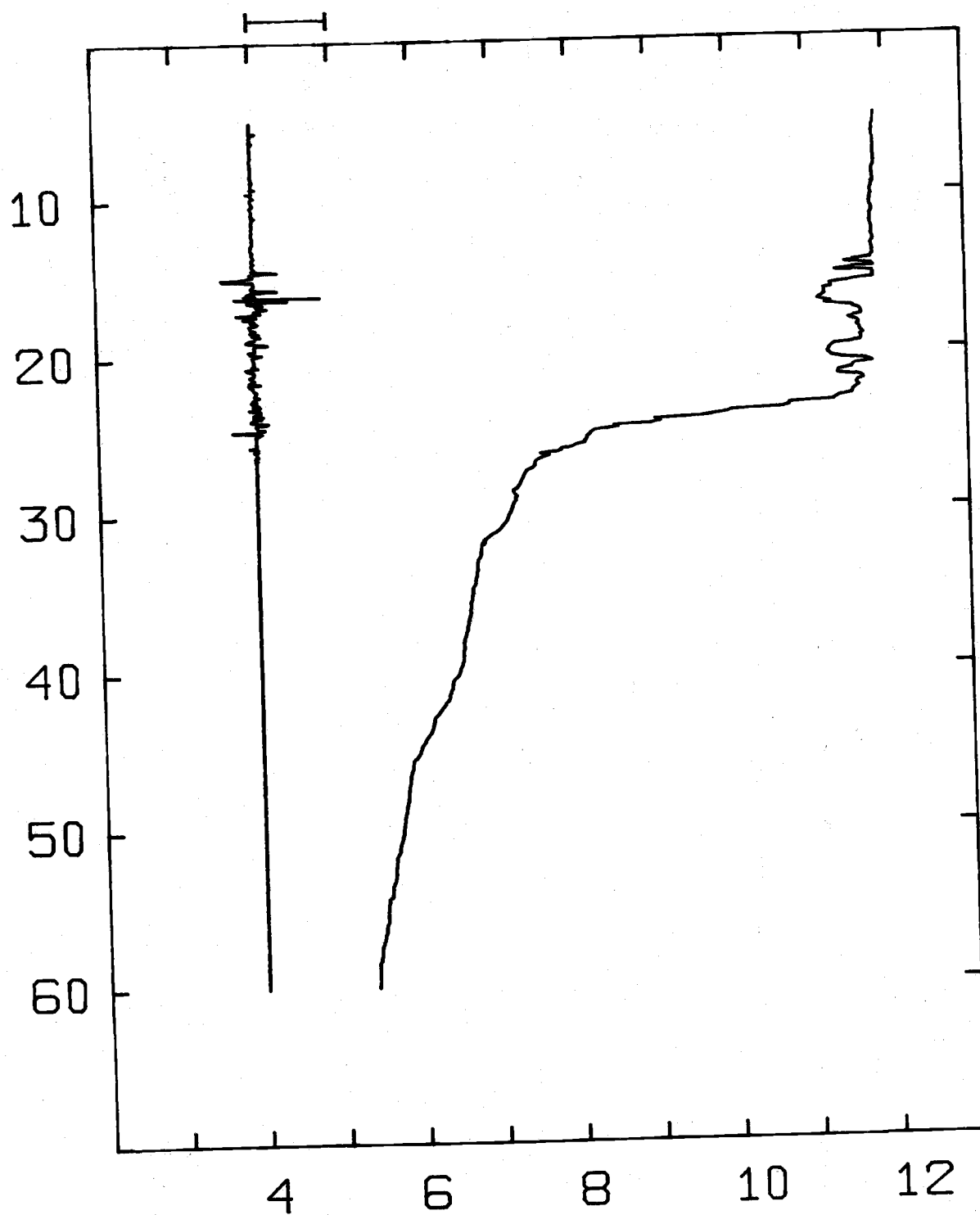
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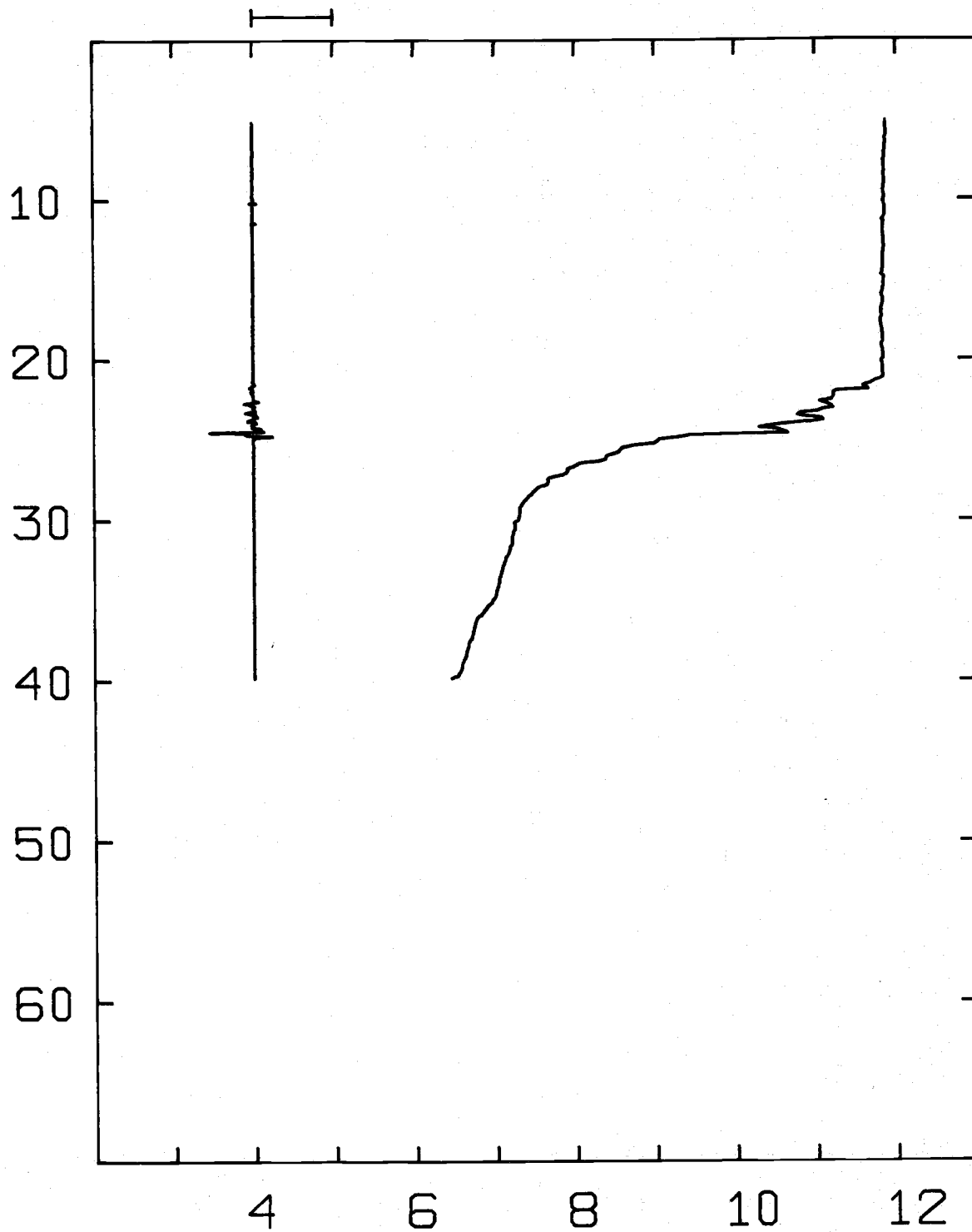
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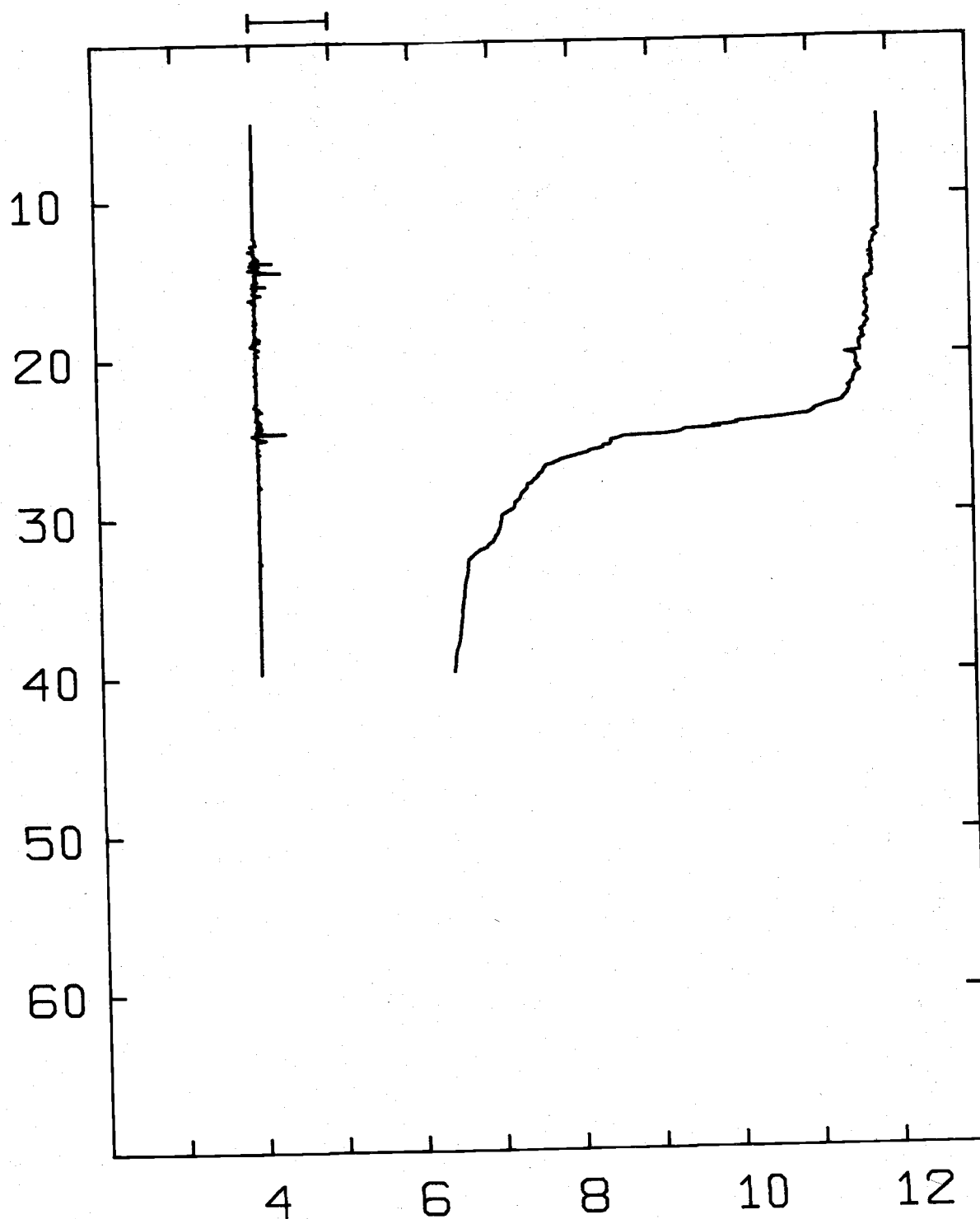
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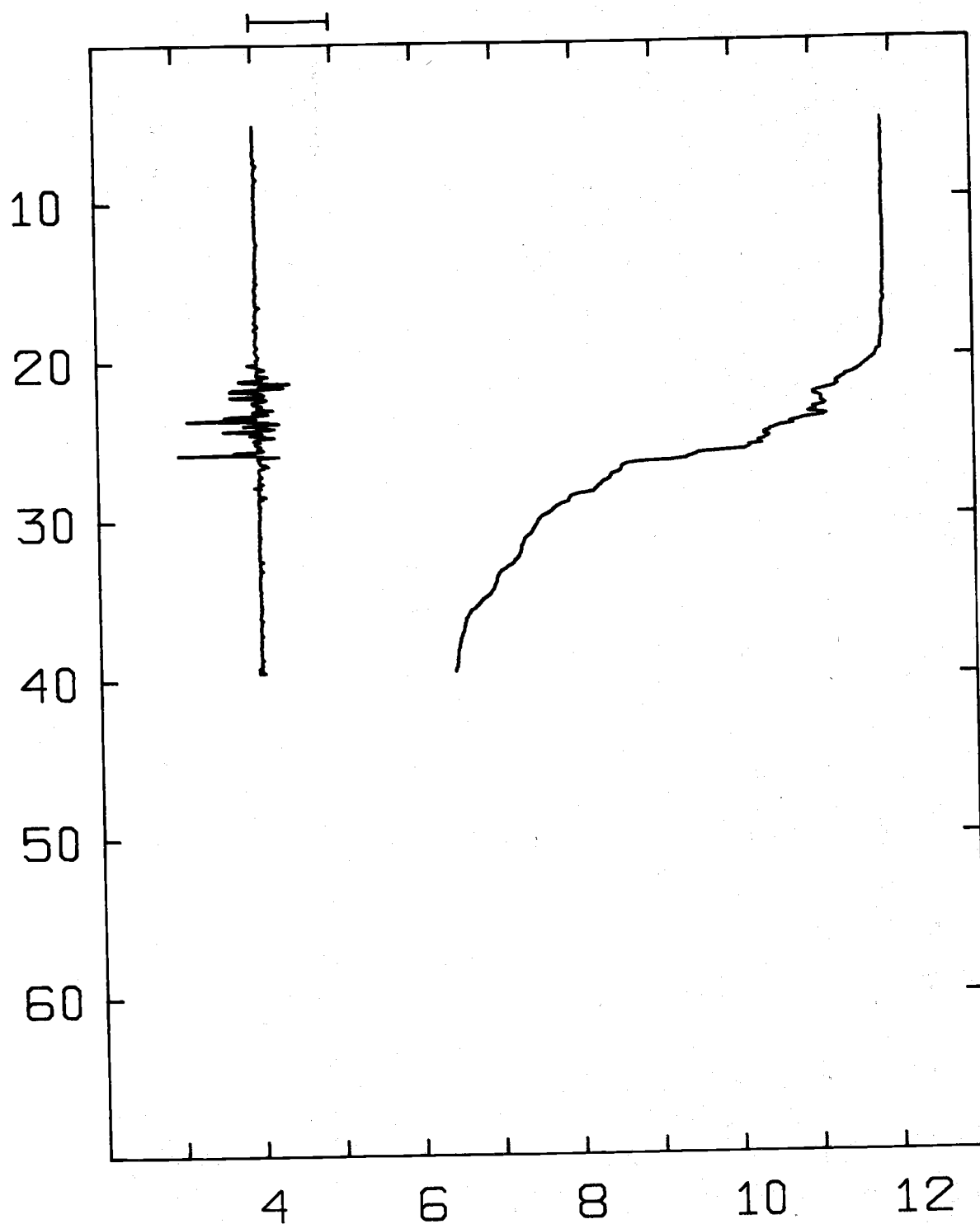
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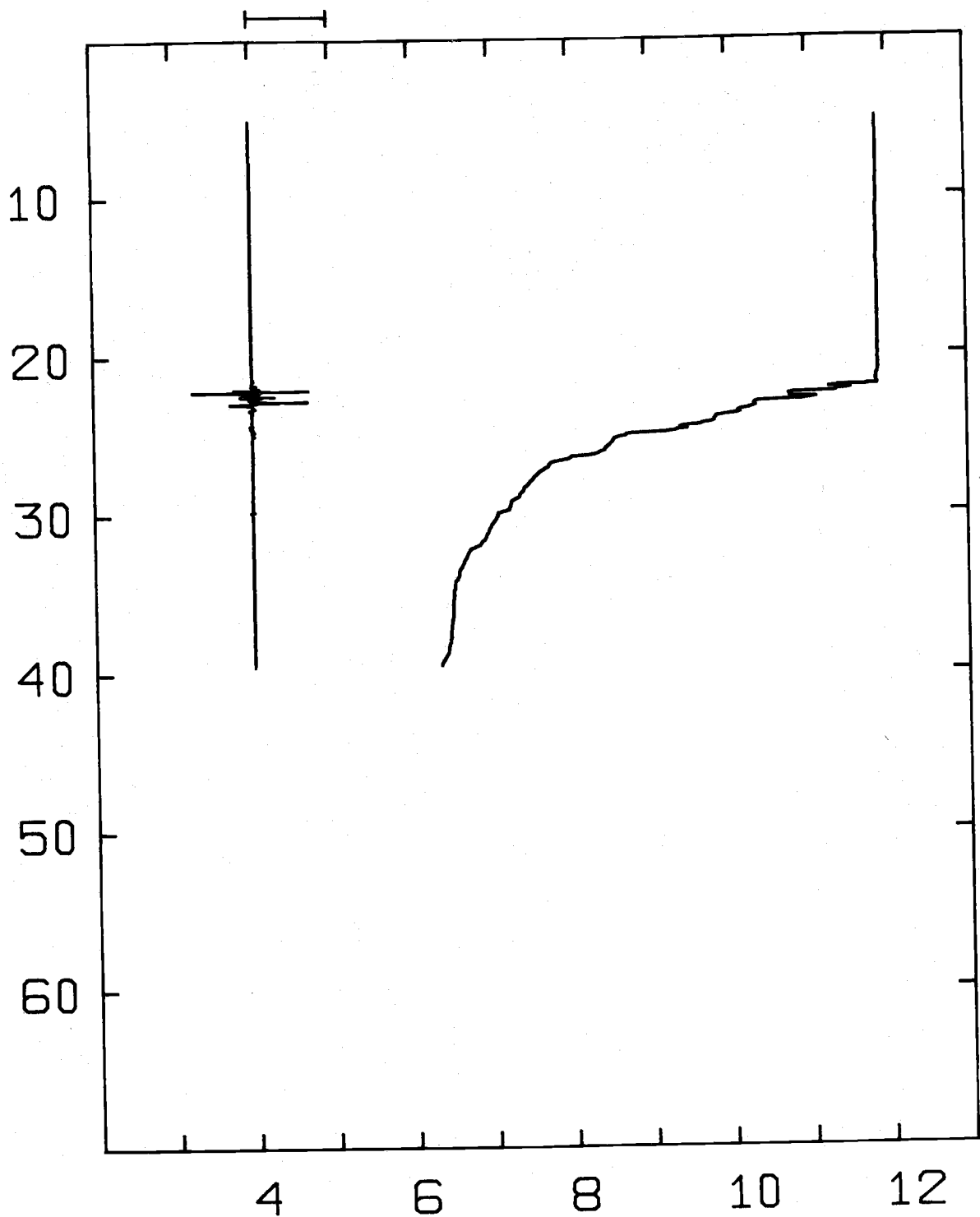
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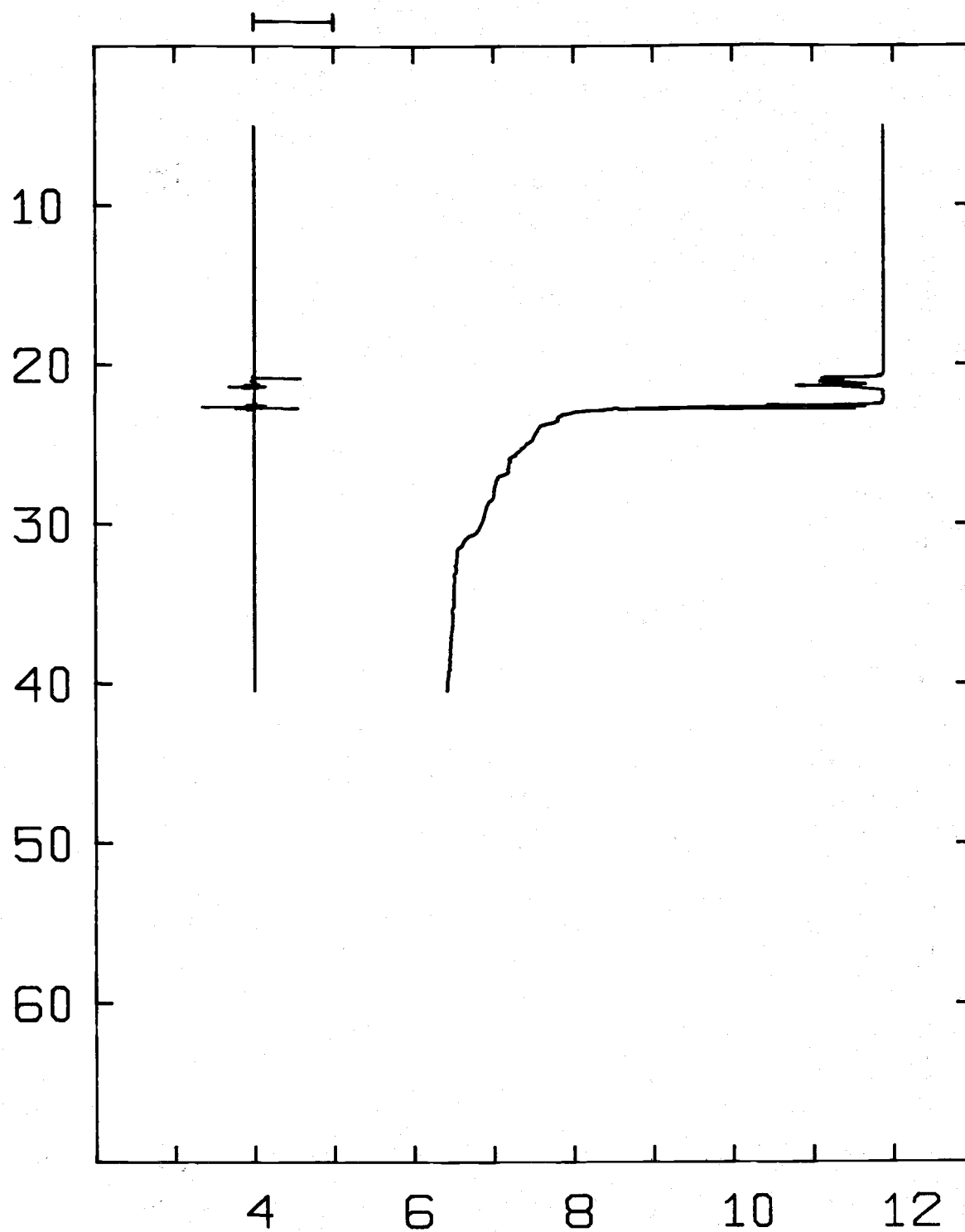
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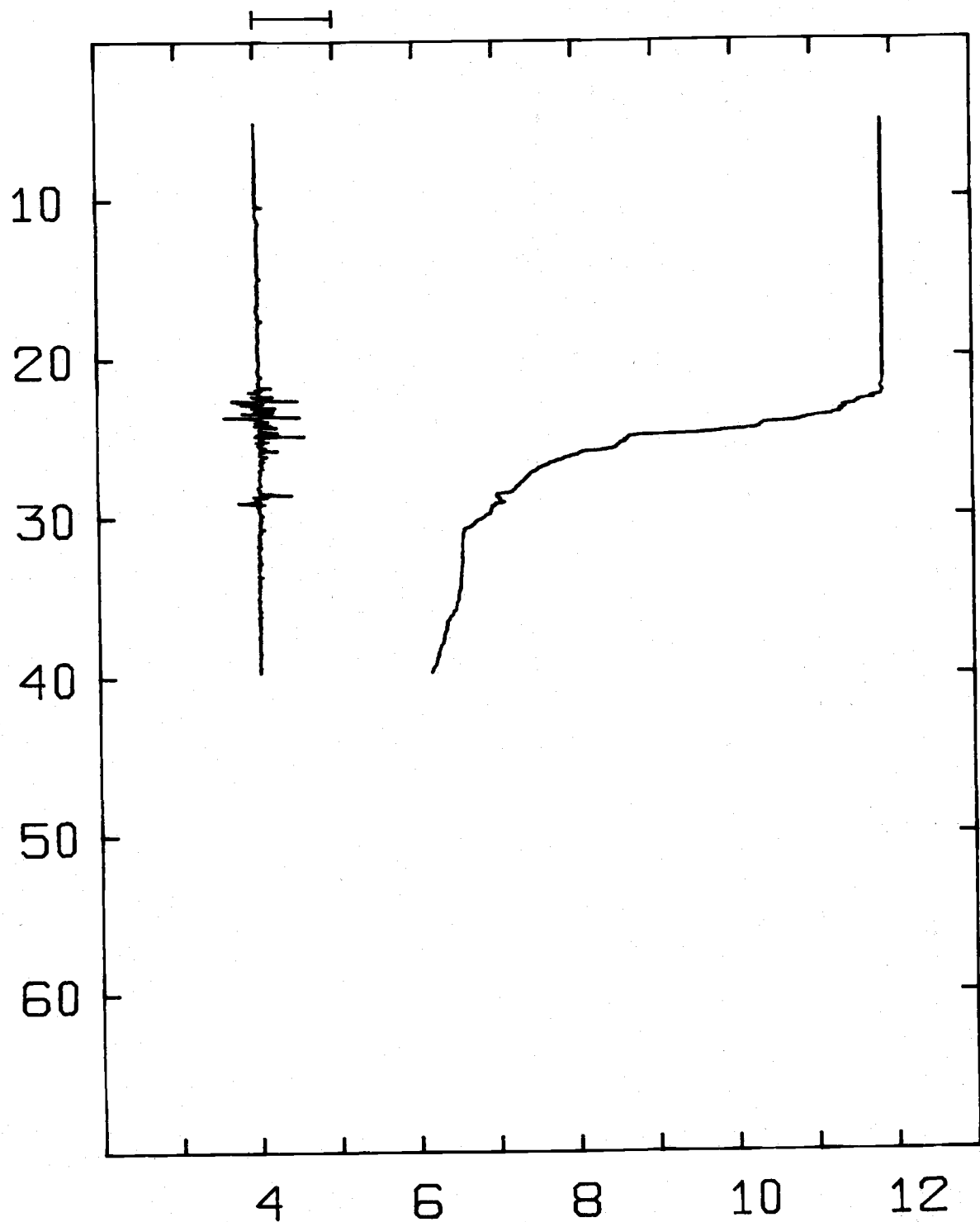
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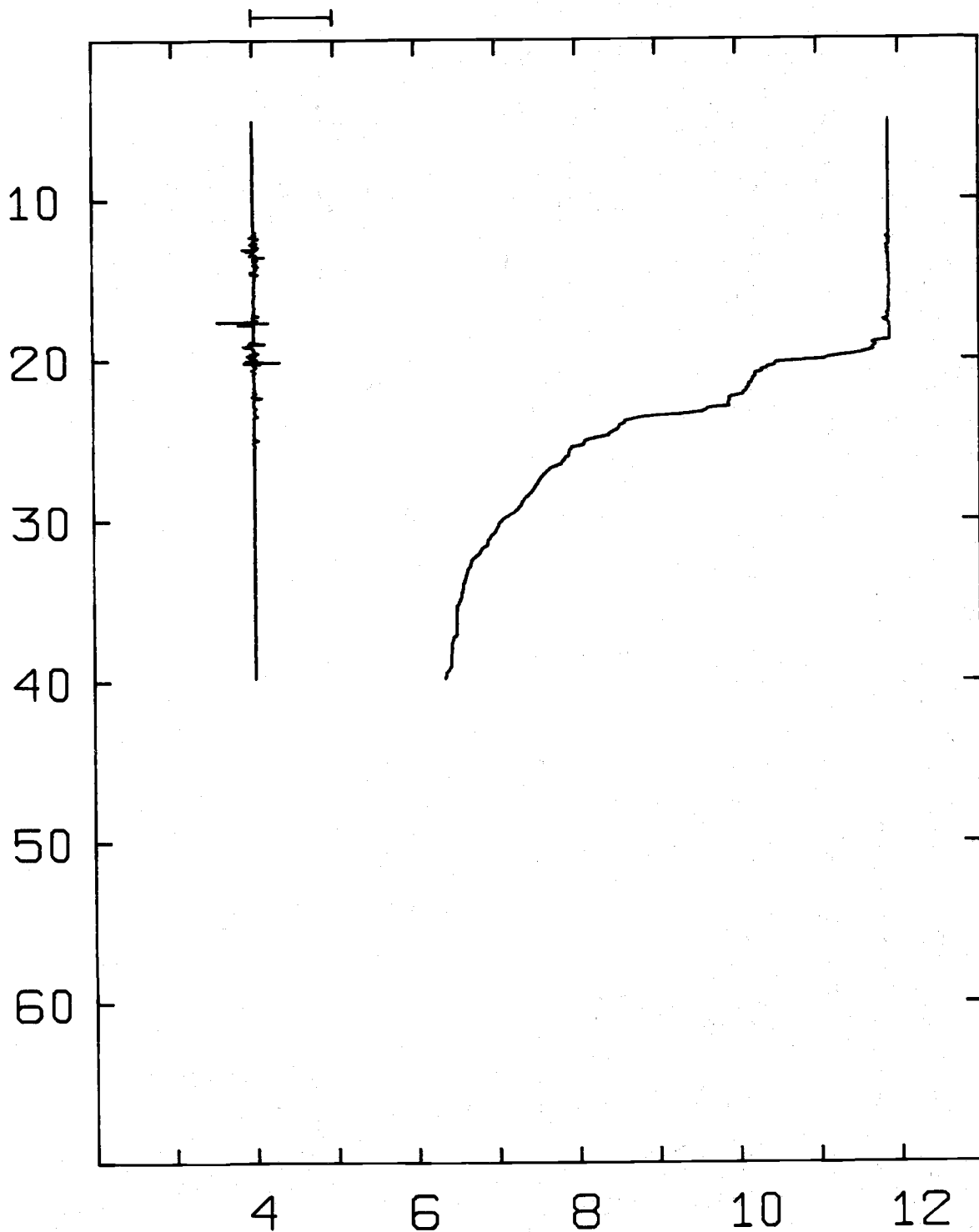
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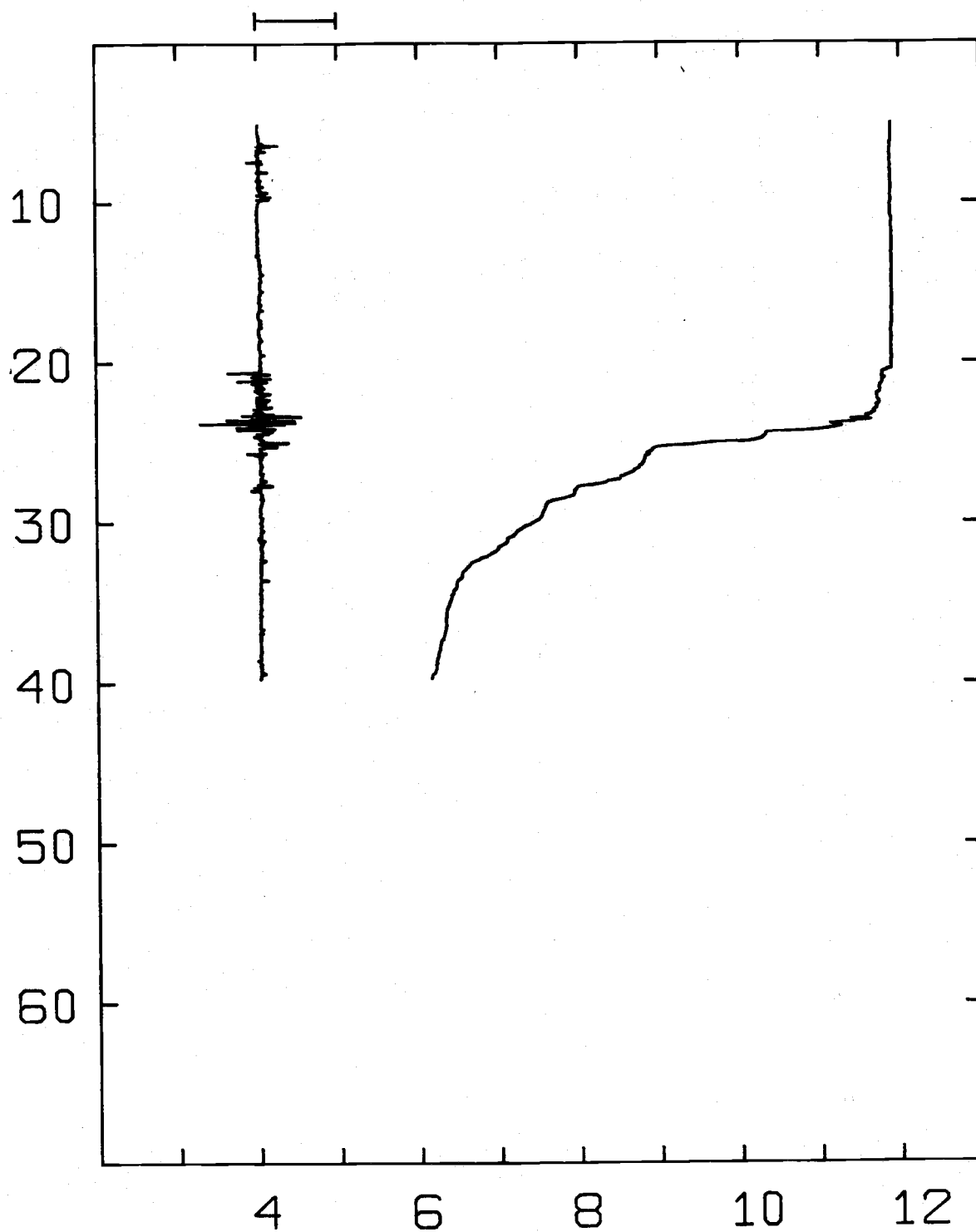
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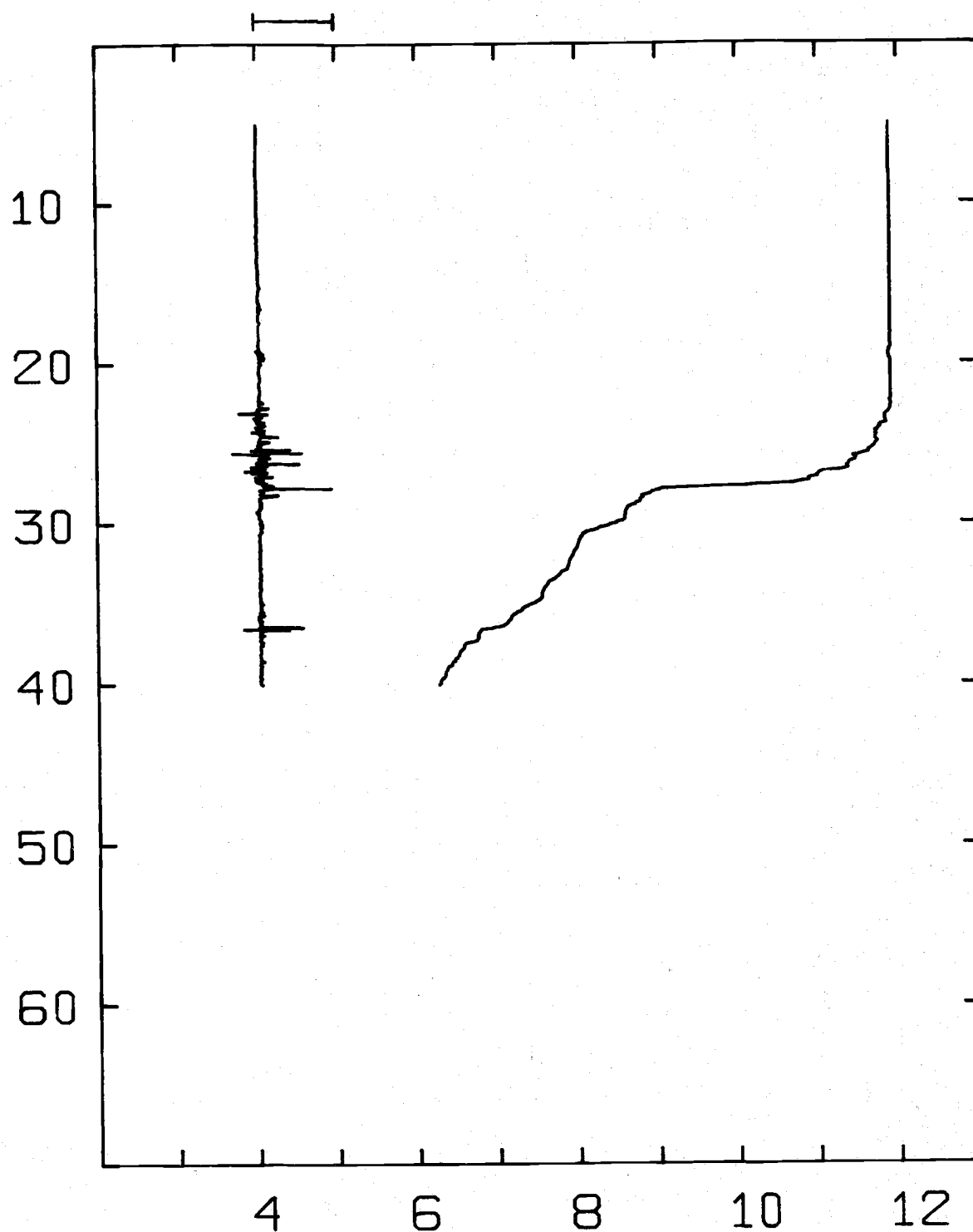
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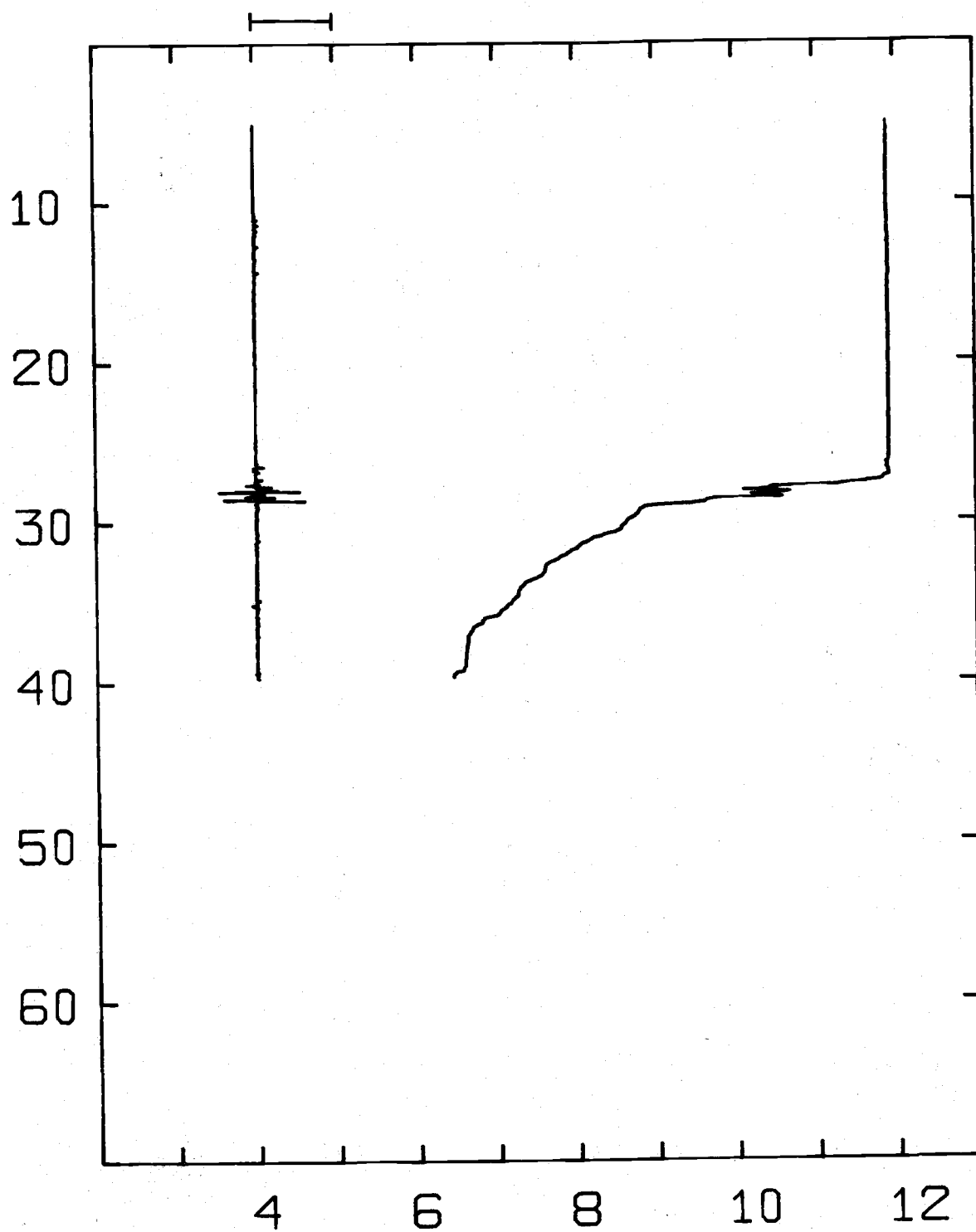
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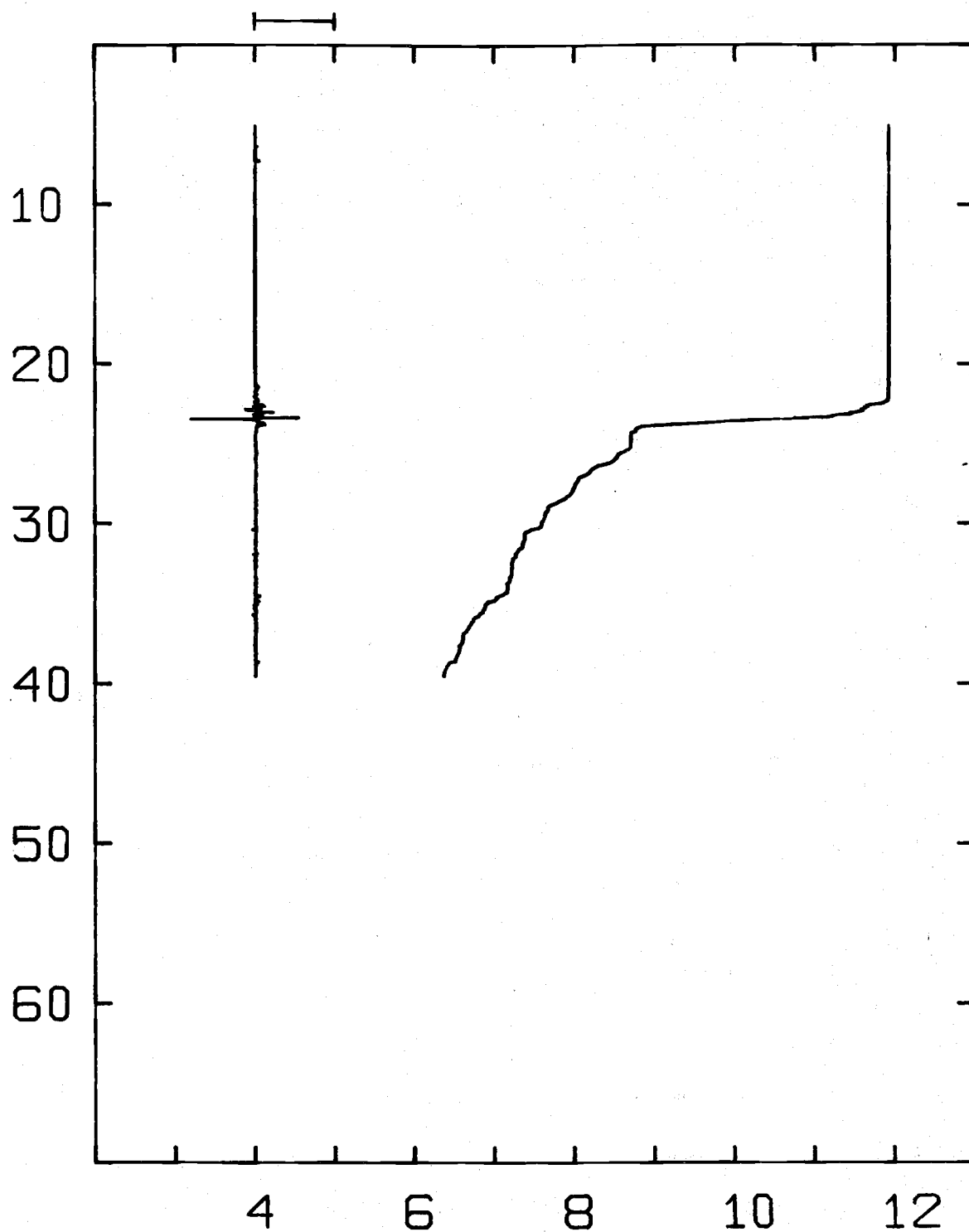
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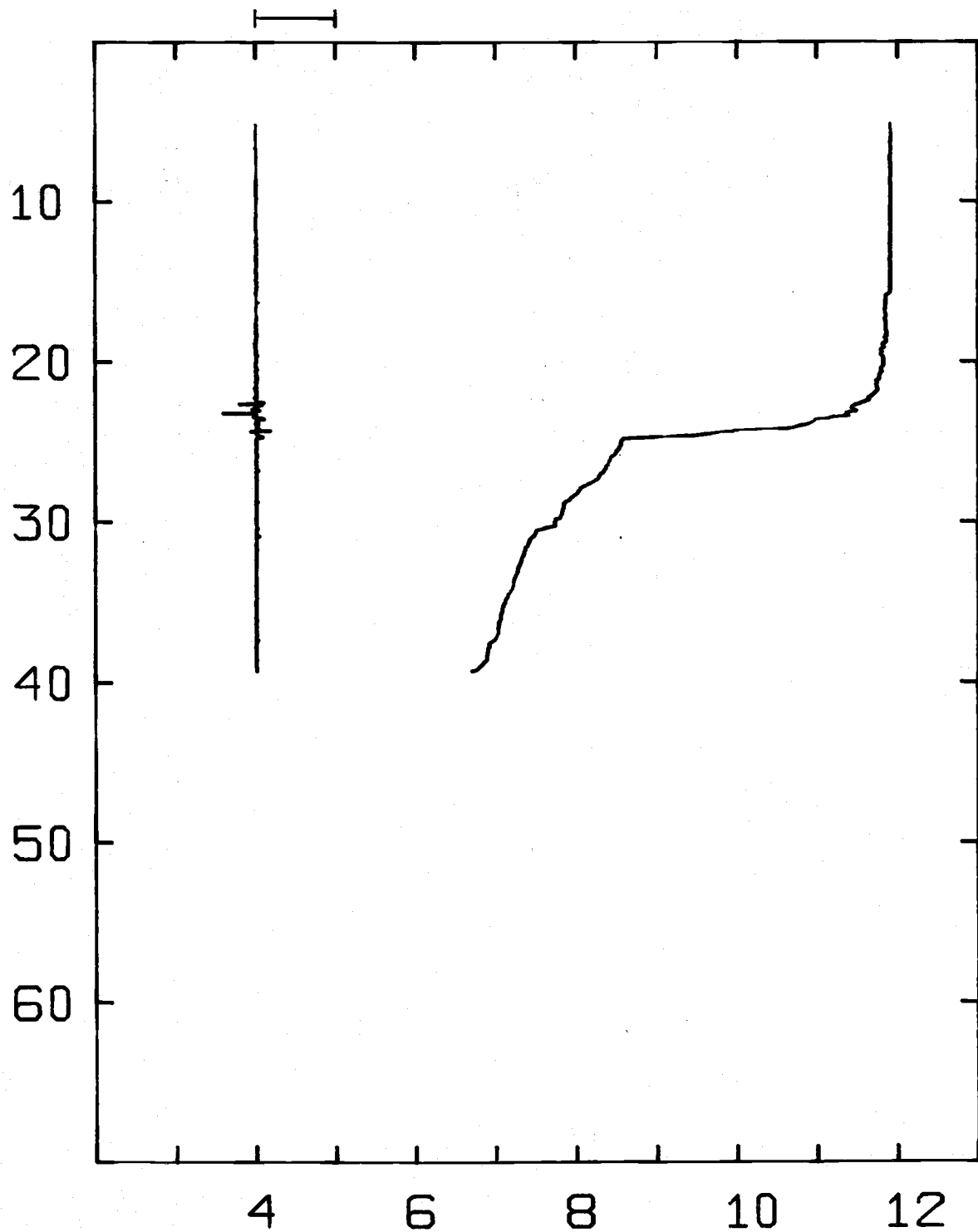
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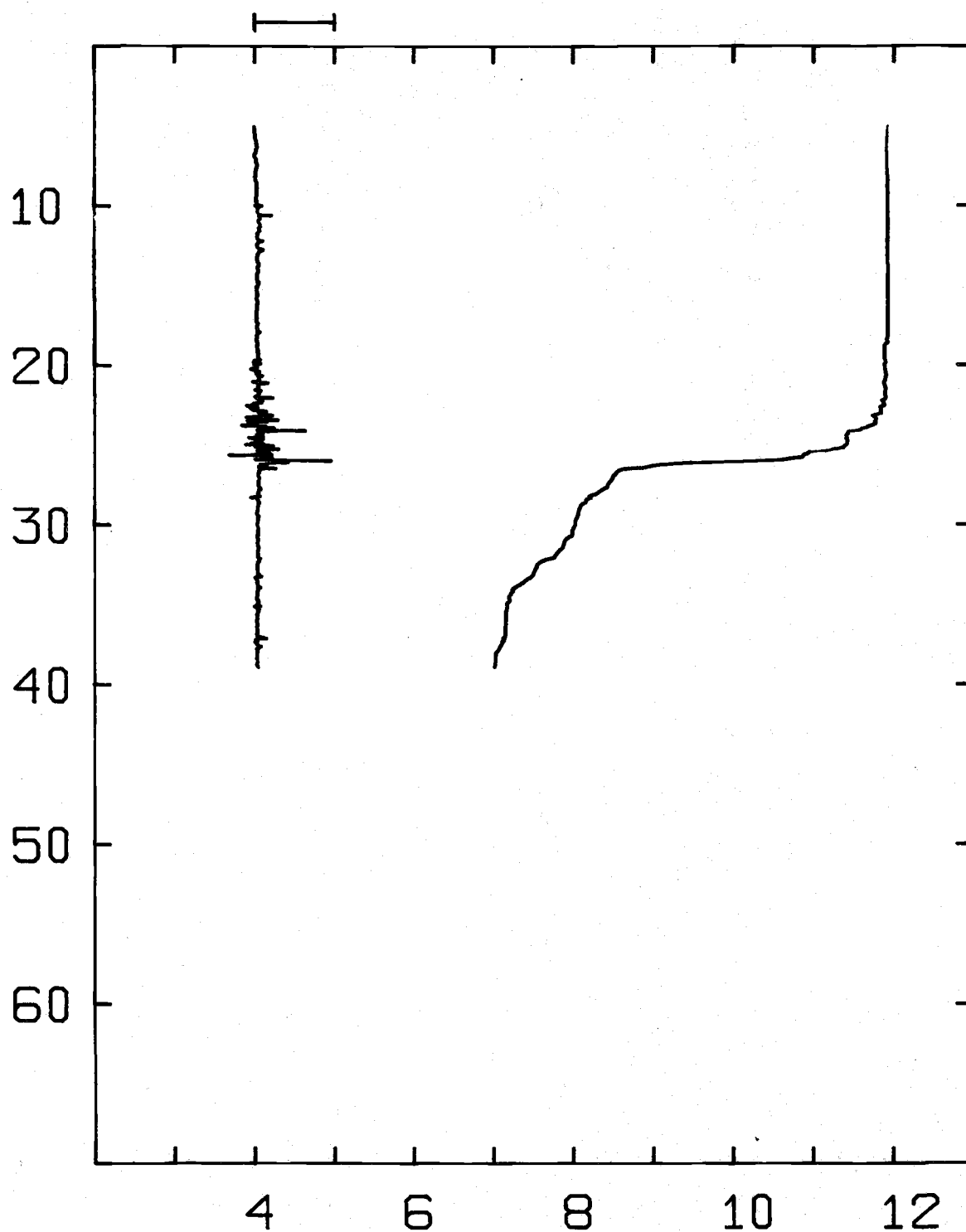
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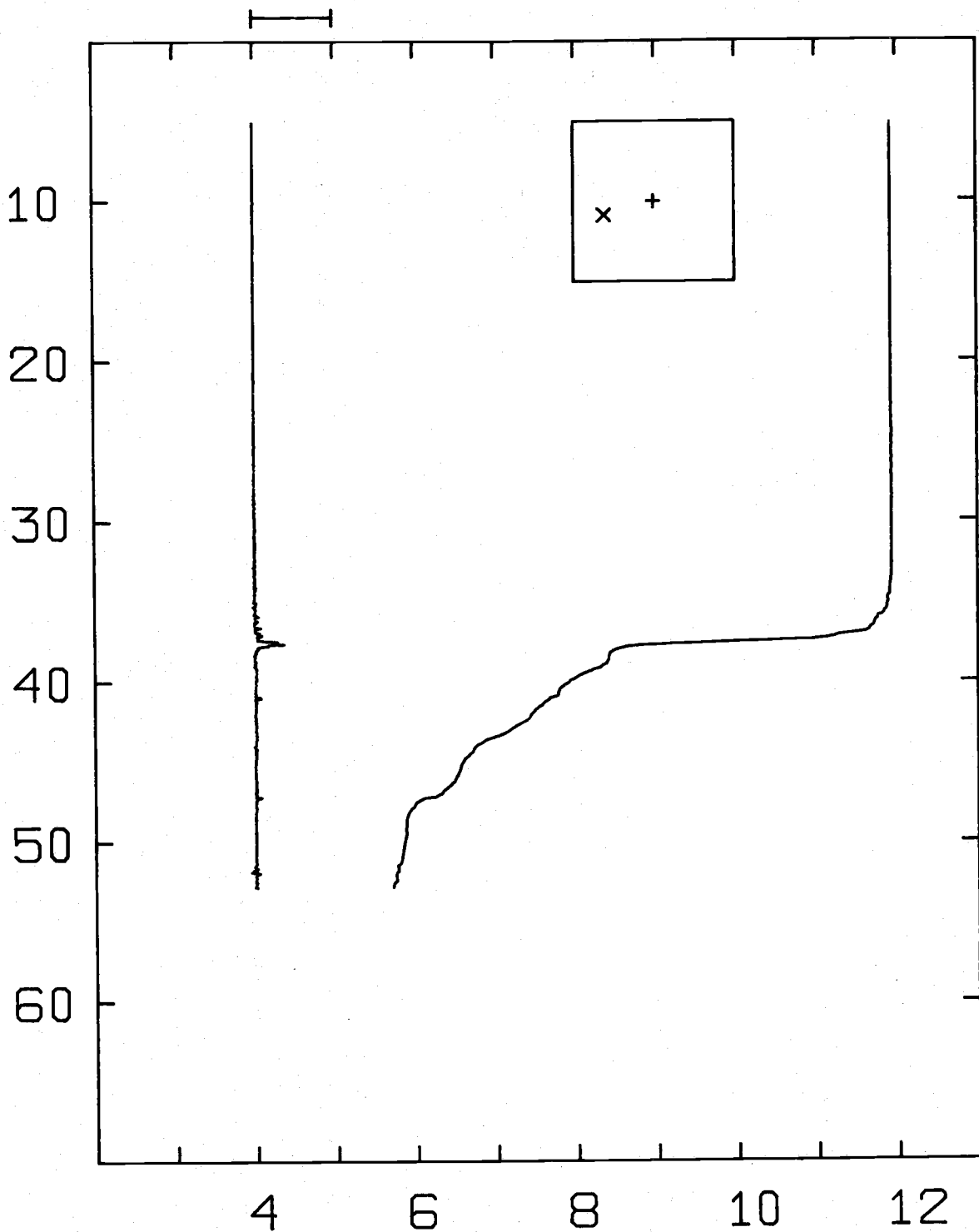
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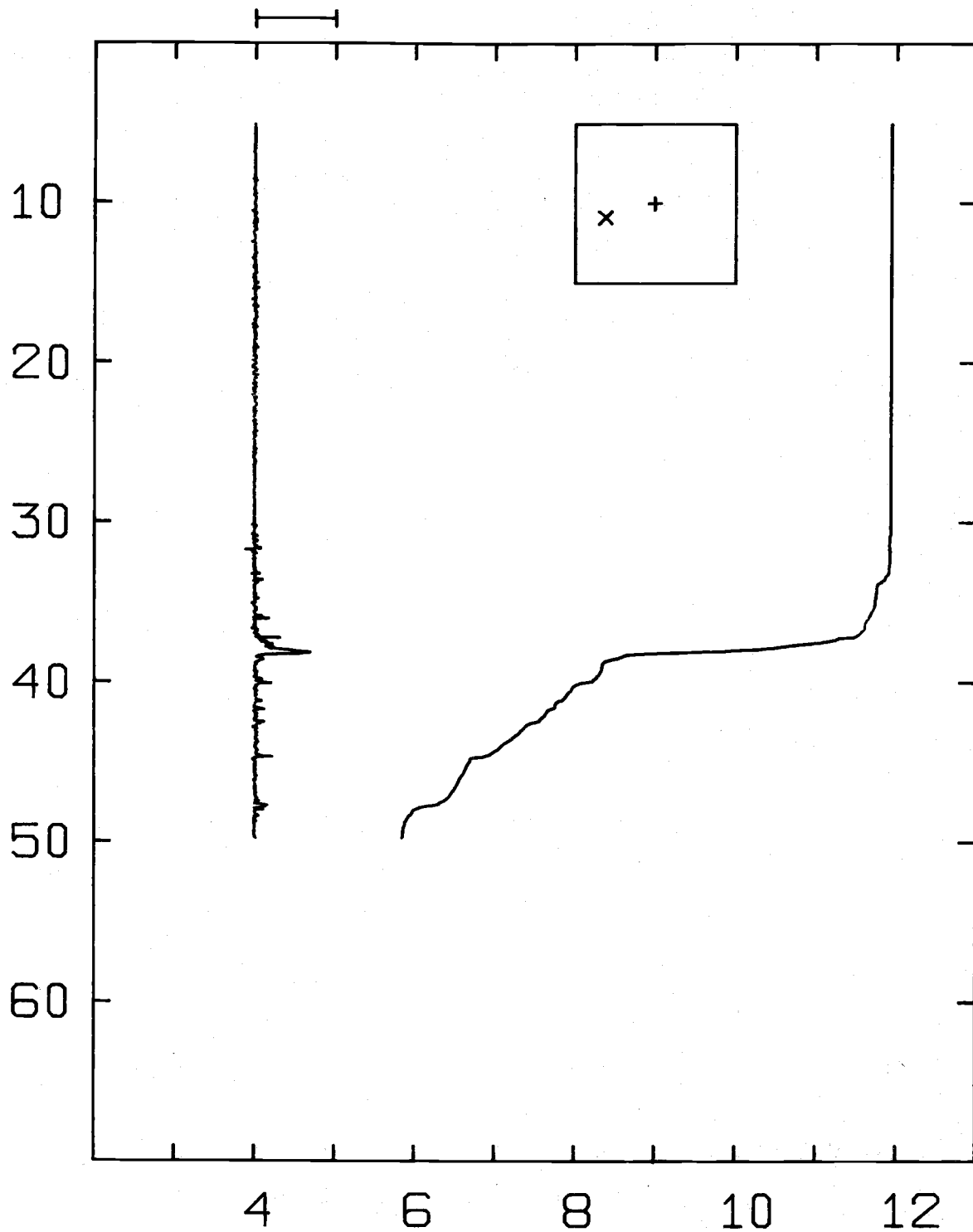
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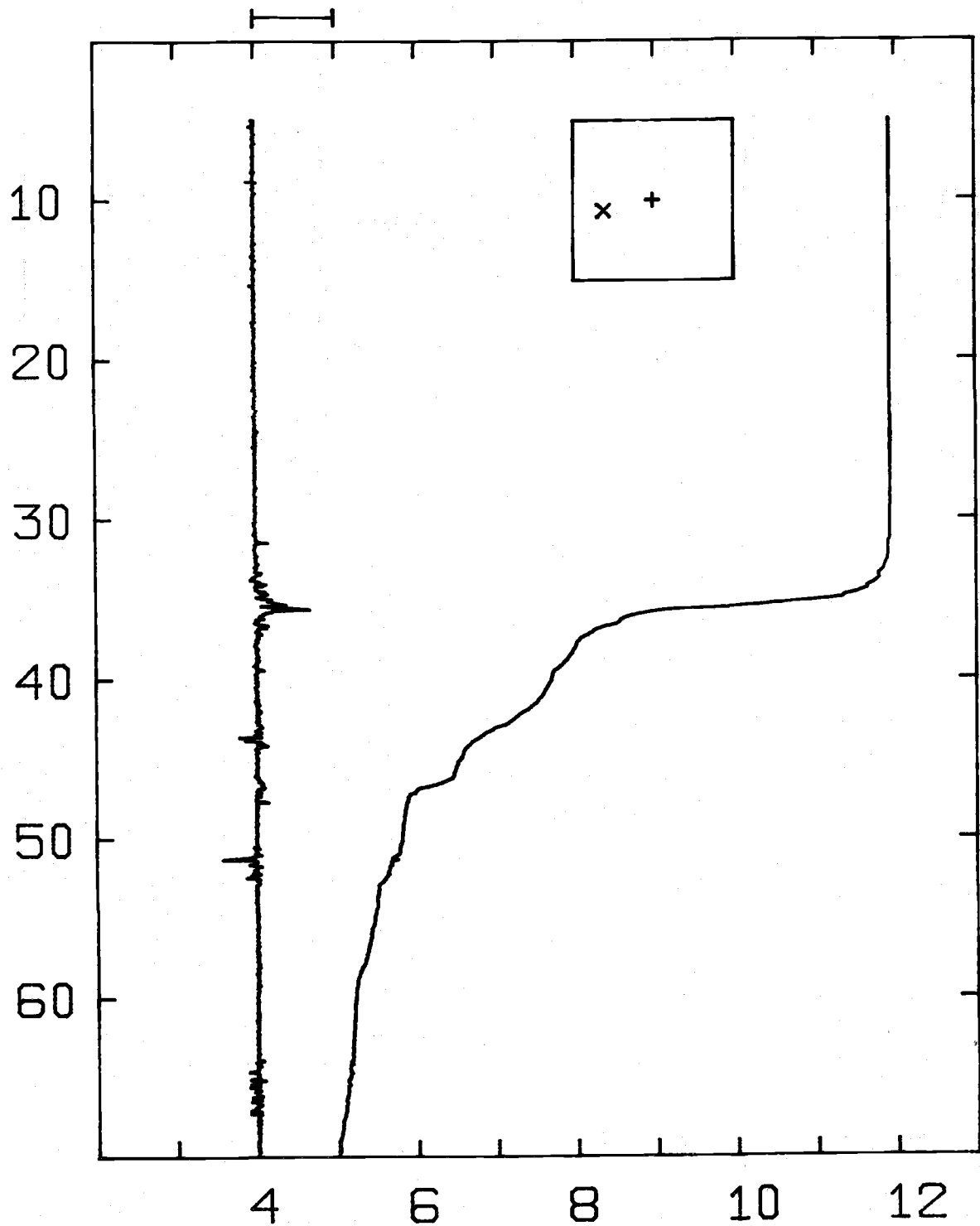
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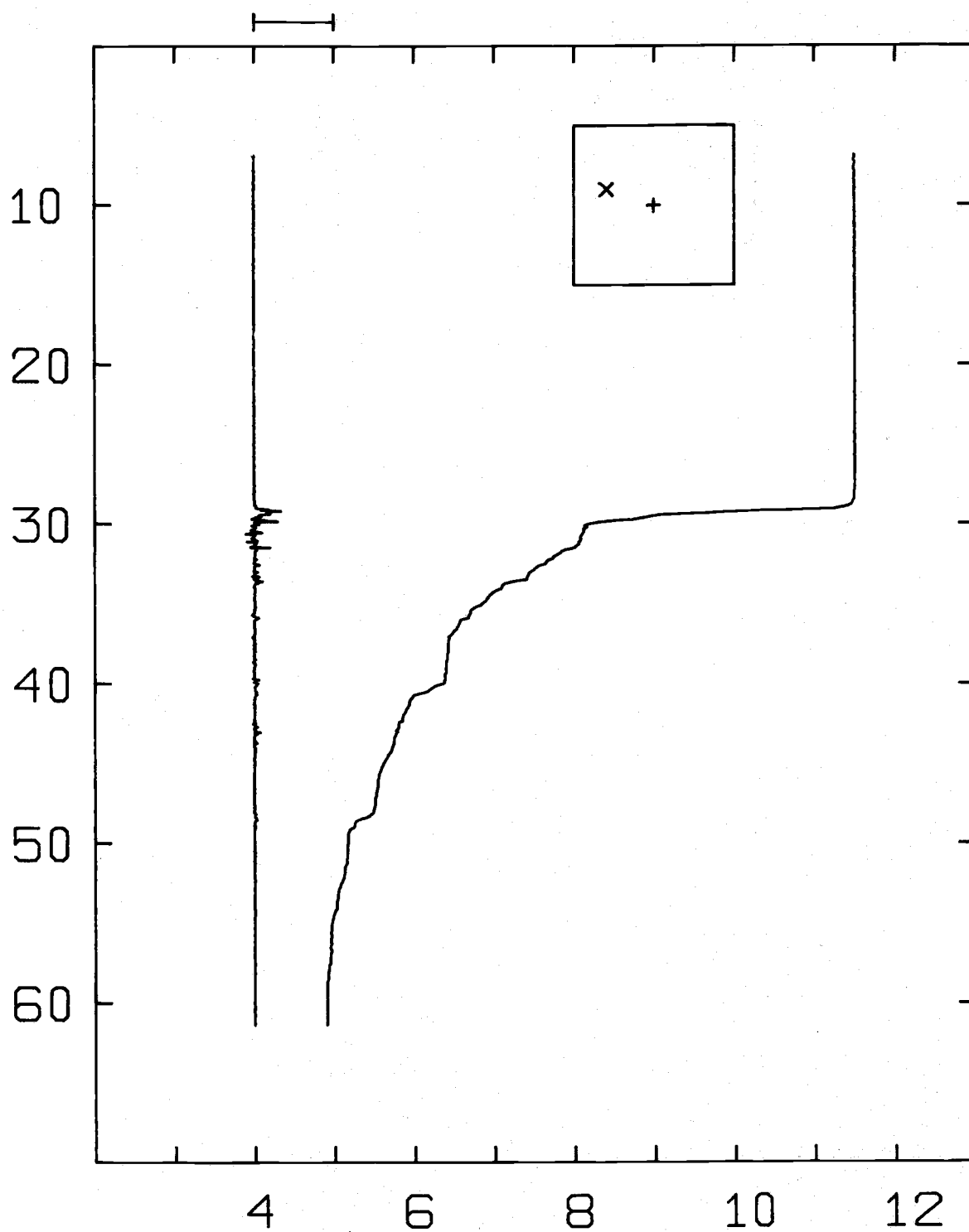
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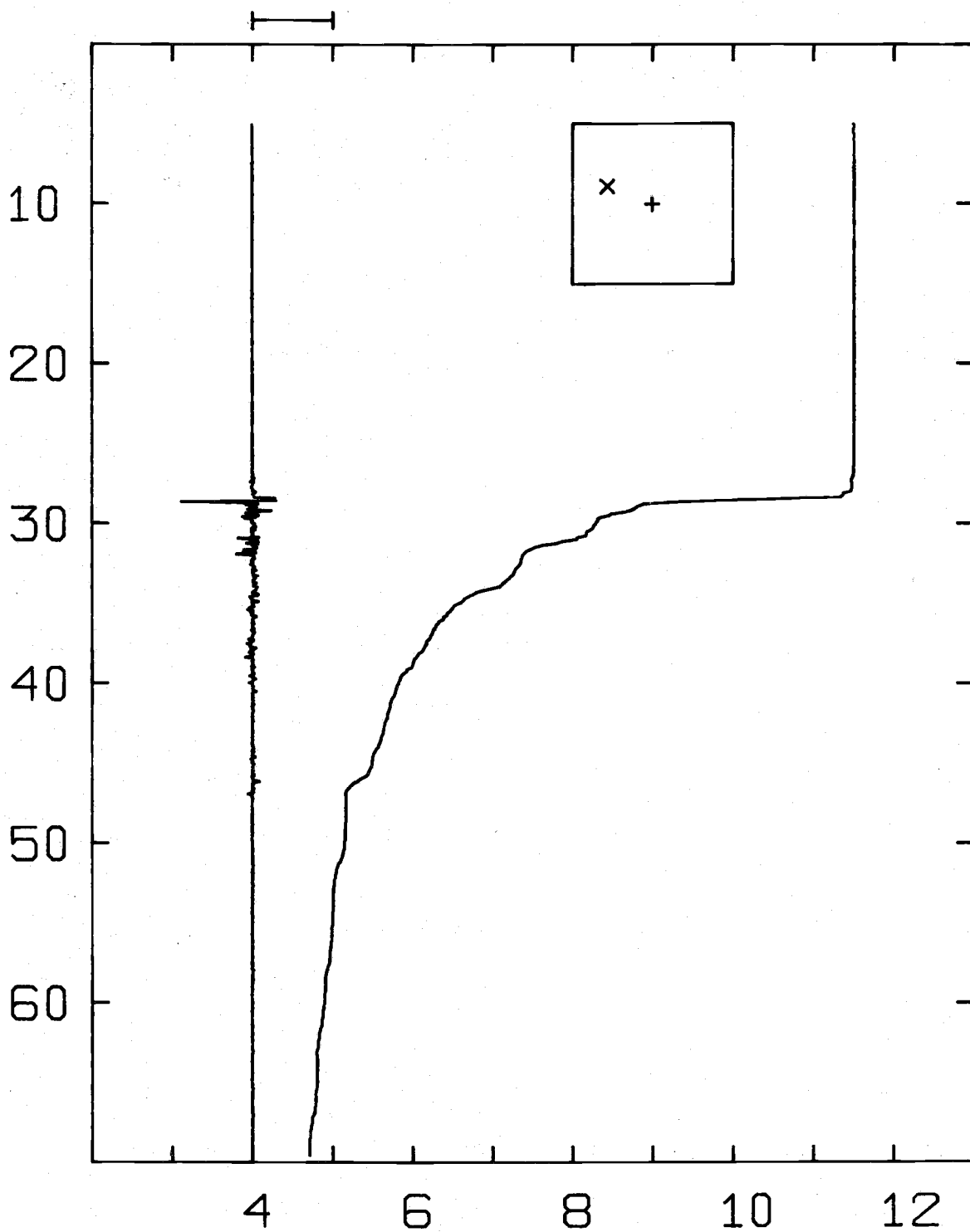
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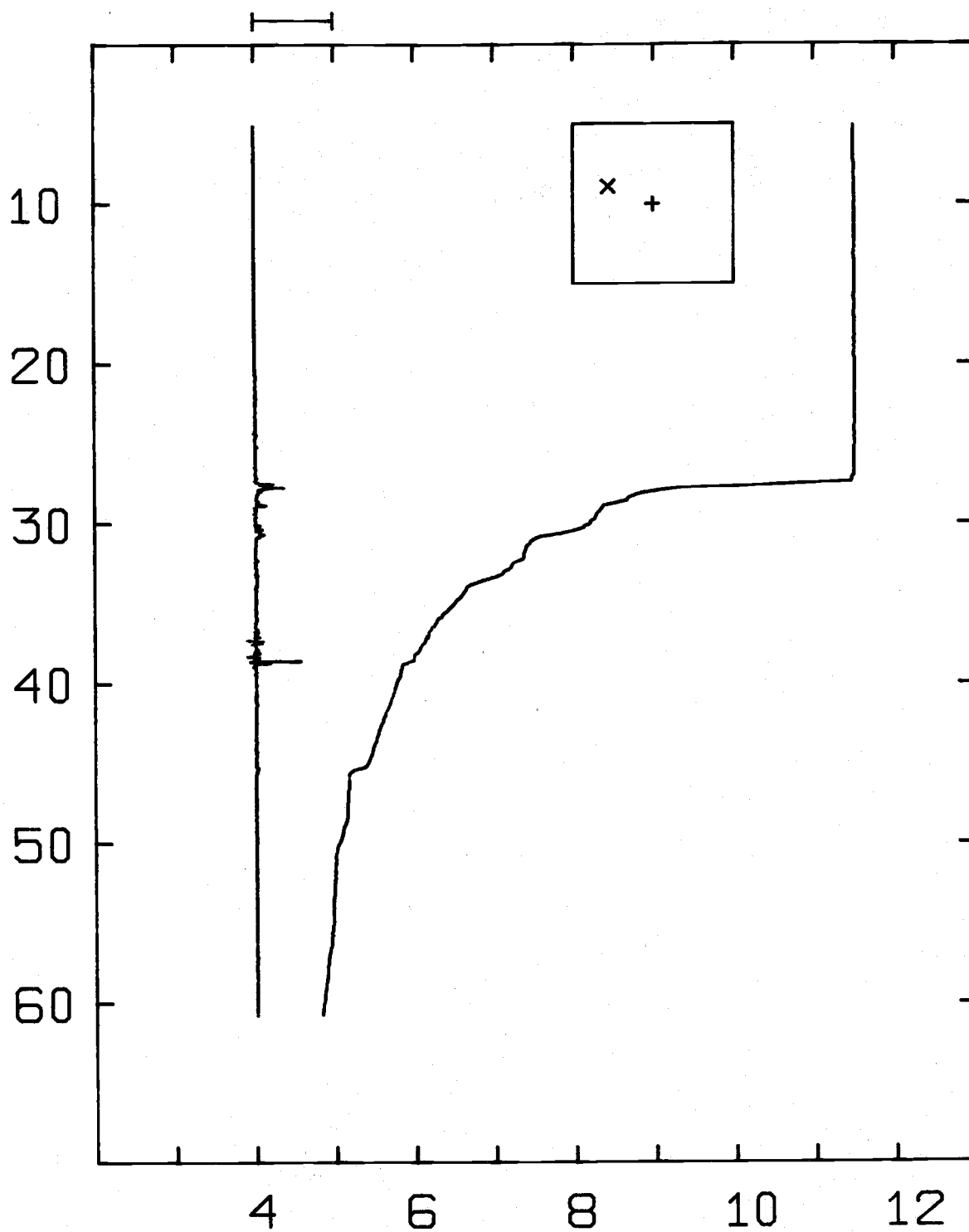
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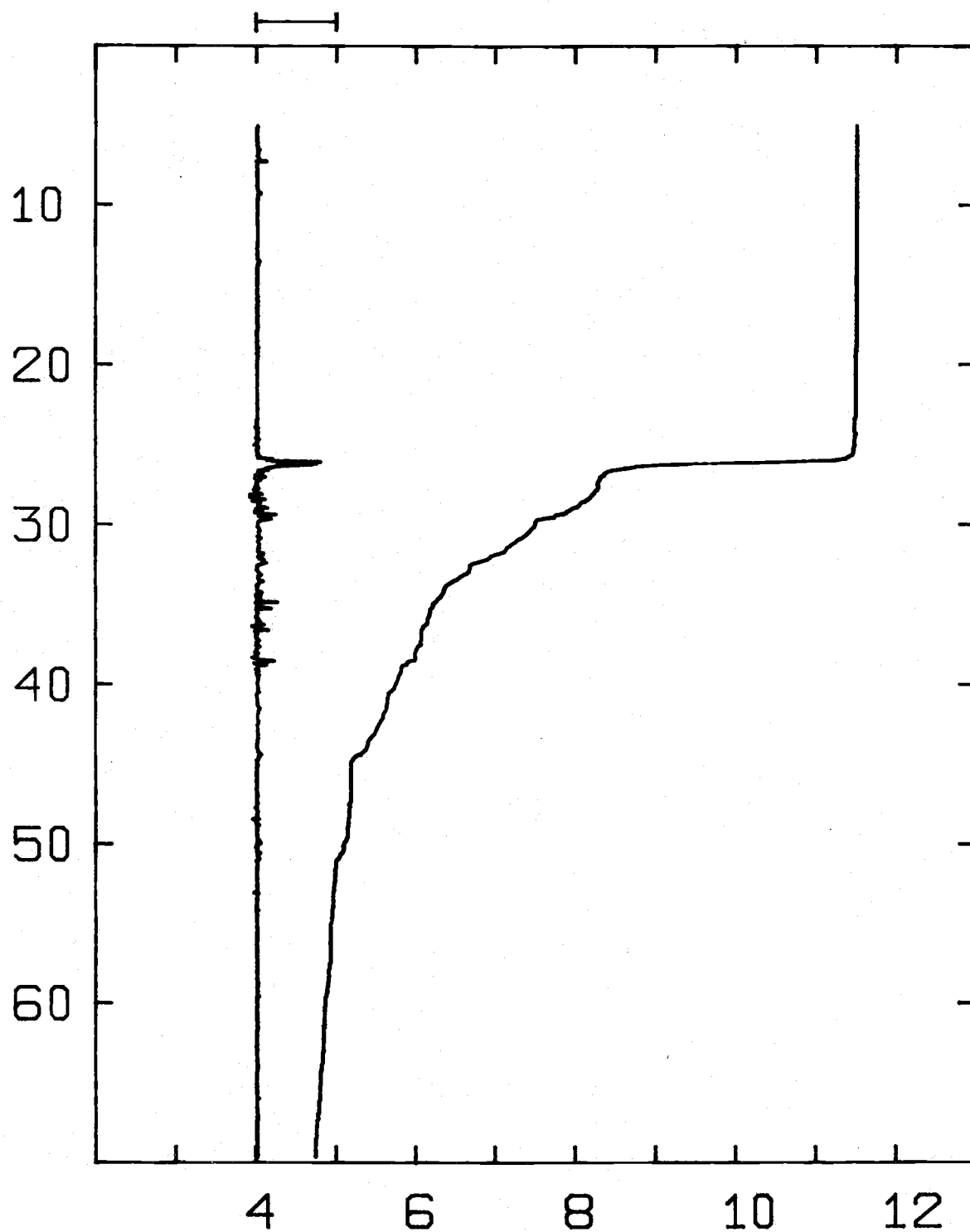
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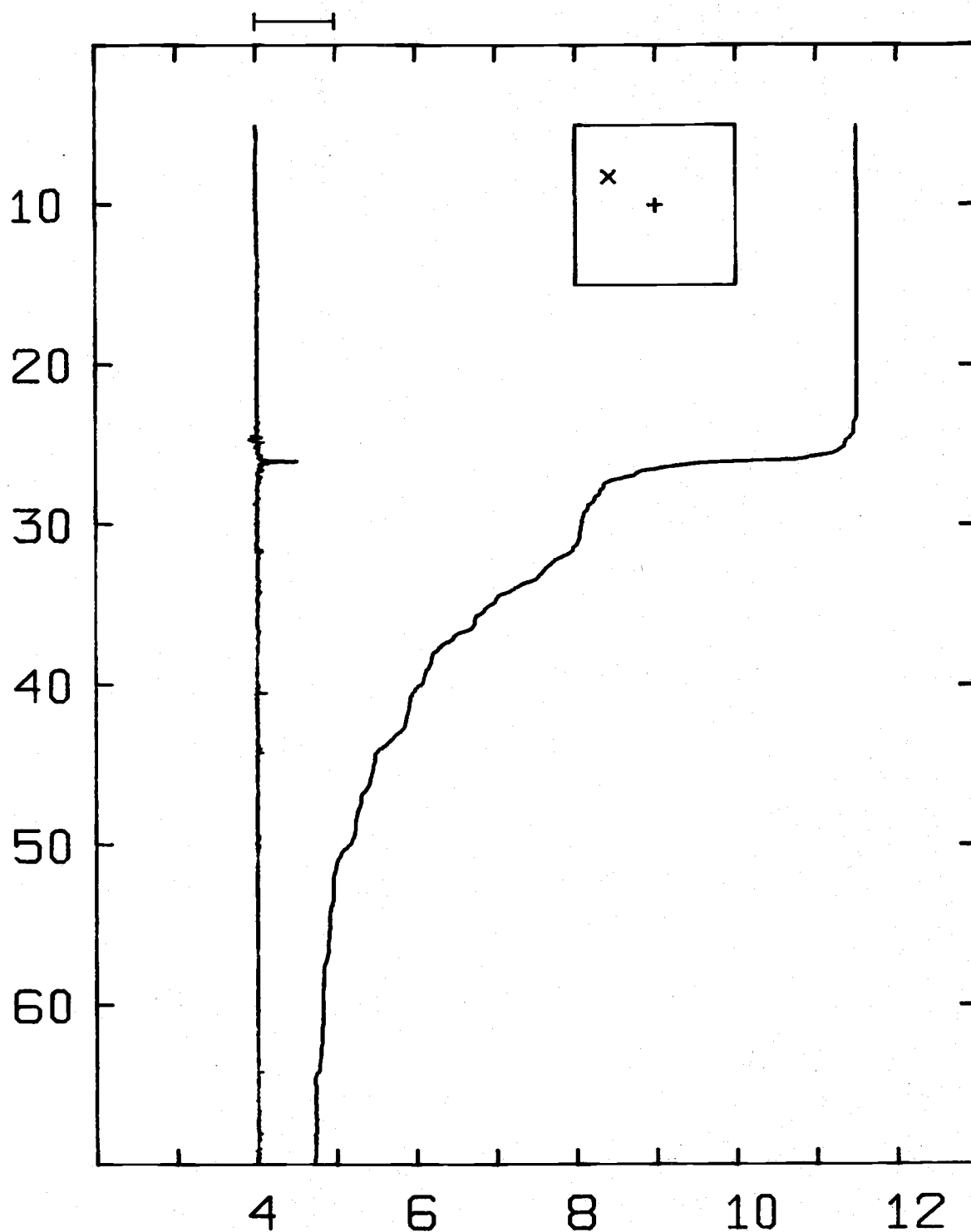
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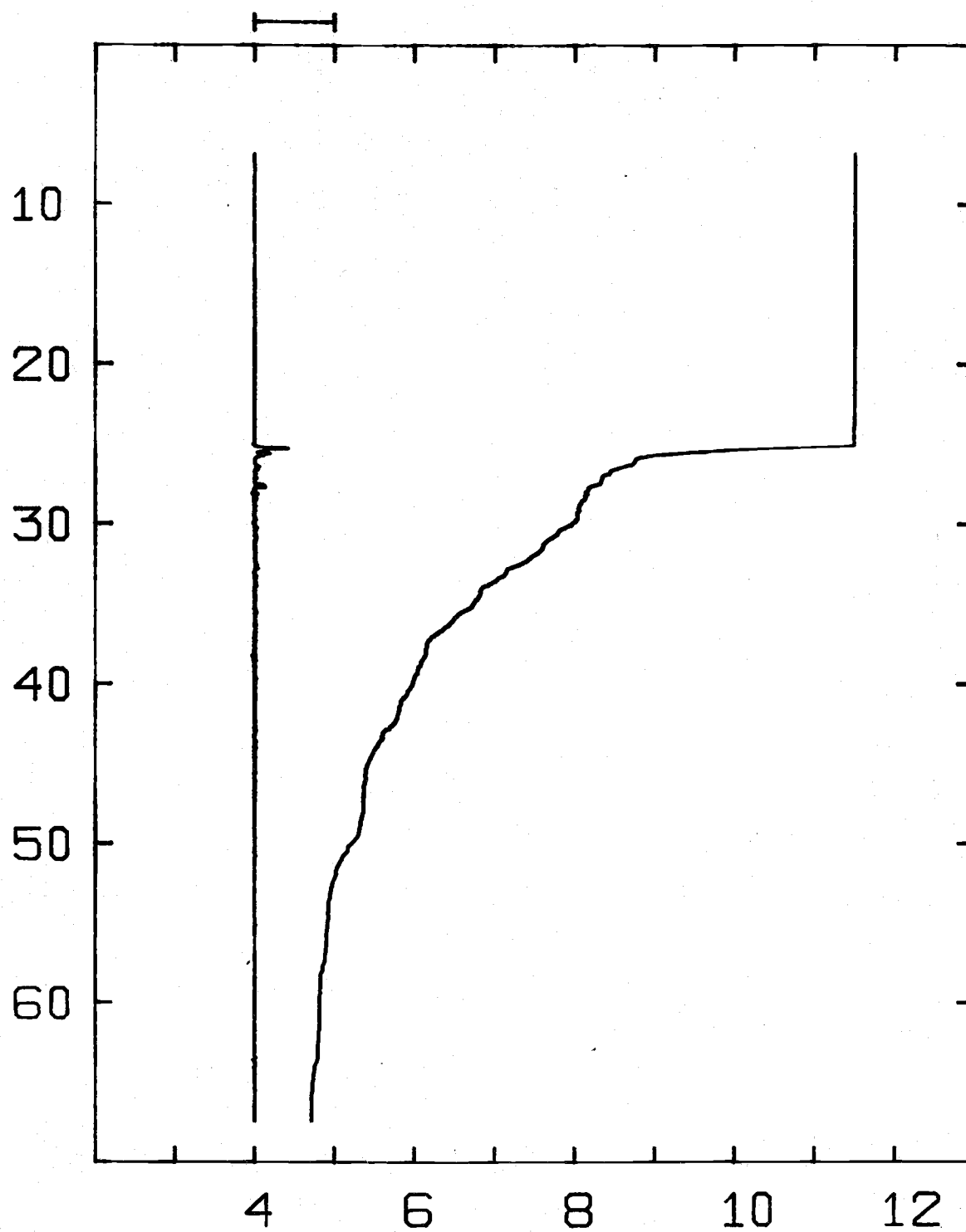
DATE 8/24/77

RANGE 3.41

TIME 1155

BEARING 122

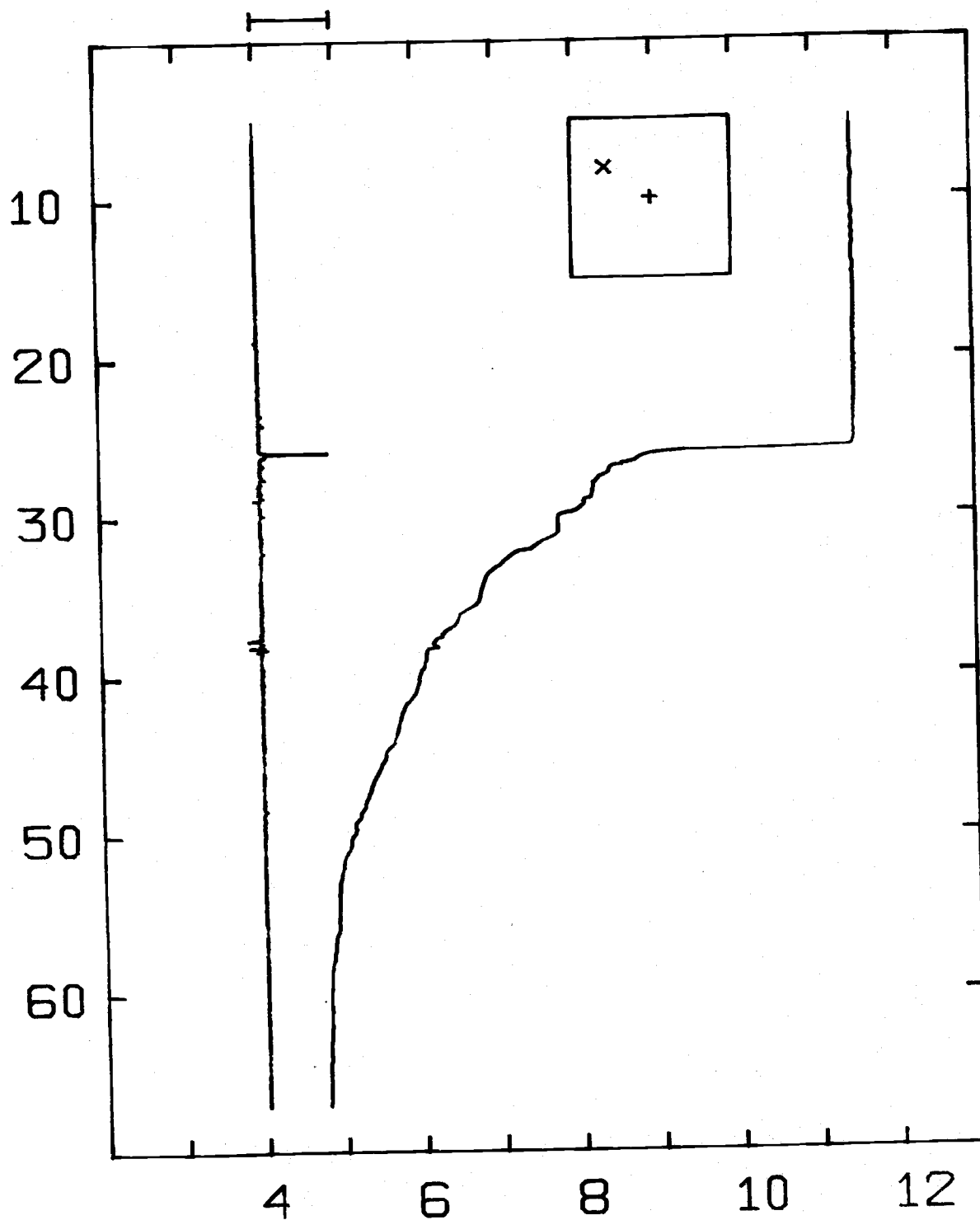
30.0 DEG/M UNIT A P823D5



DATE 8/24/77

TIME 1209

30.0 DEG/M UNIT A P823D6



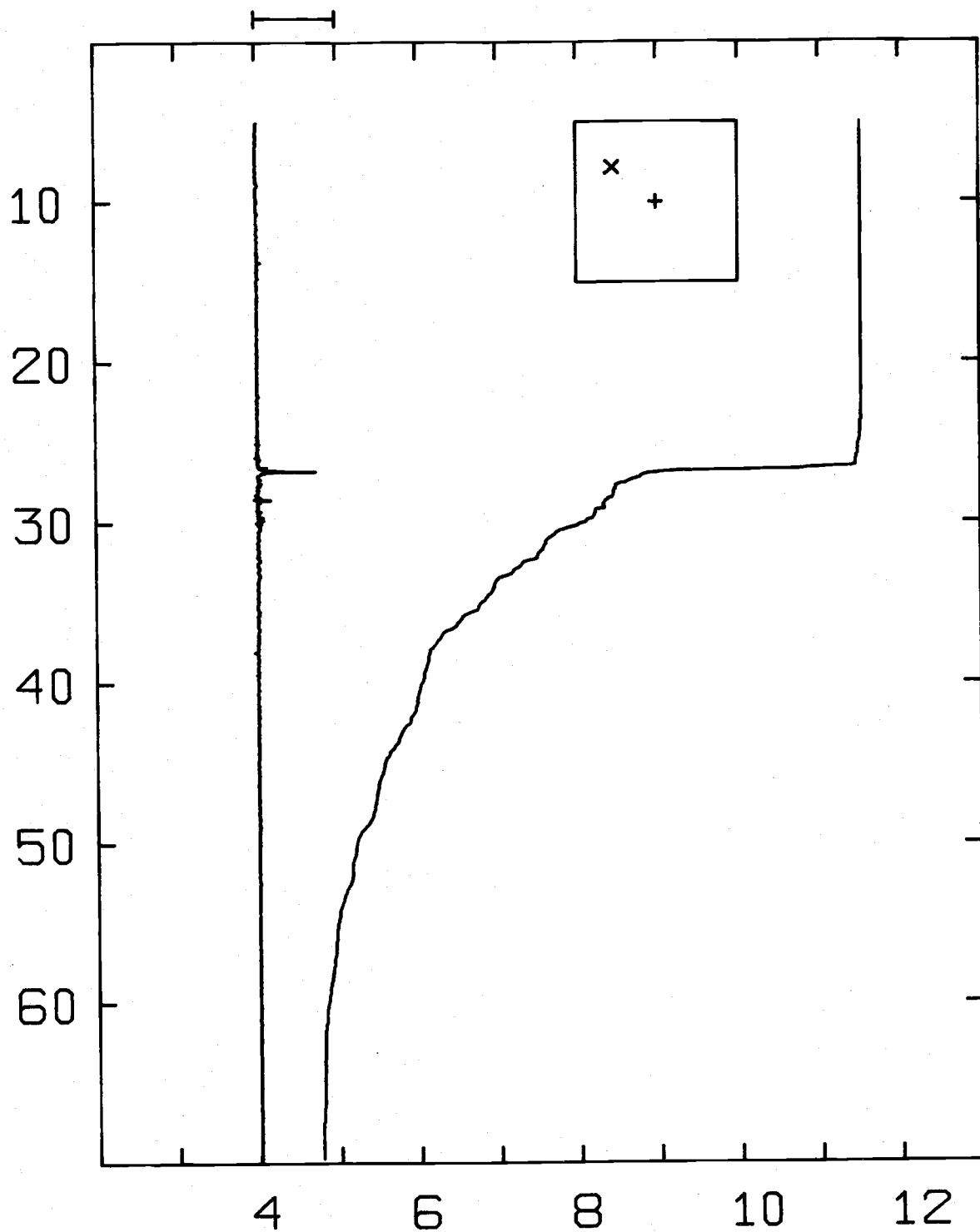
DATE 8/24/77

RANGE 3.47

TIME 1215

BEARING 124

30.0 DEG/M UNIT A P823E1



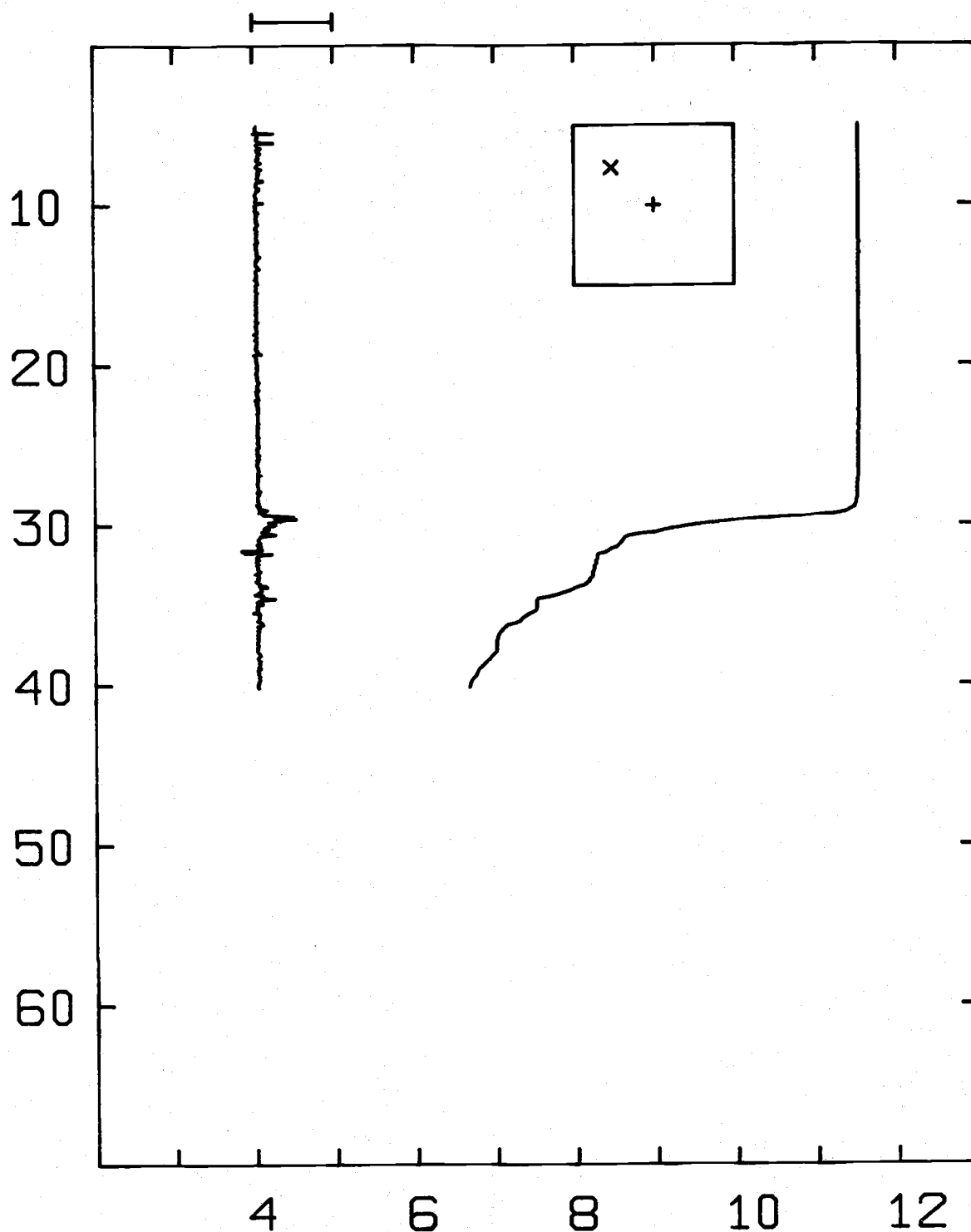
DATE 8/24/77

RANGE 3.47

TIME 1230

BEARING 128

10.0 DEG/M UNIT A P823E2



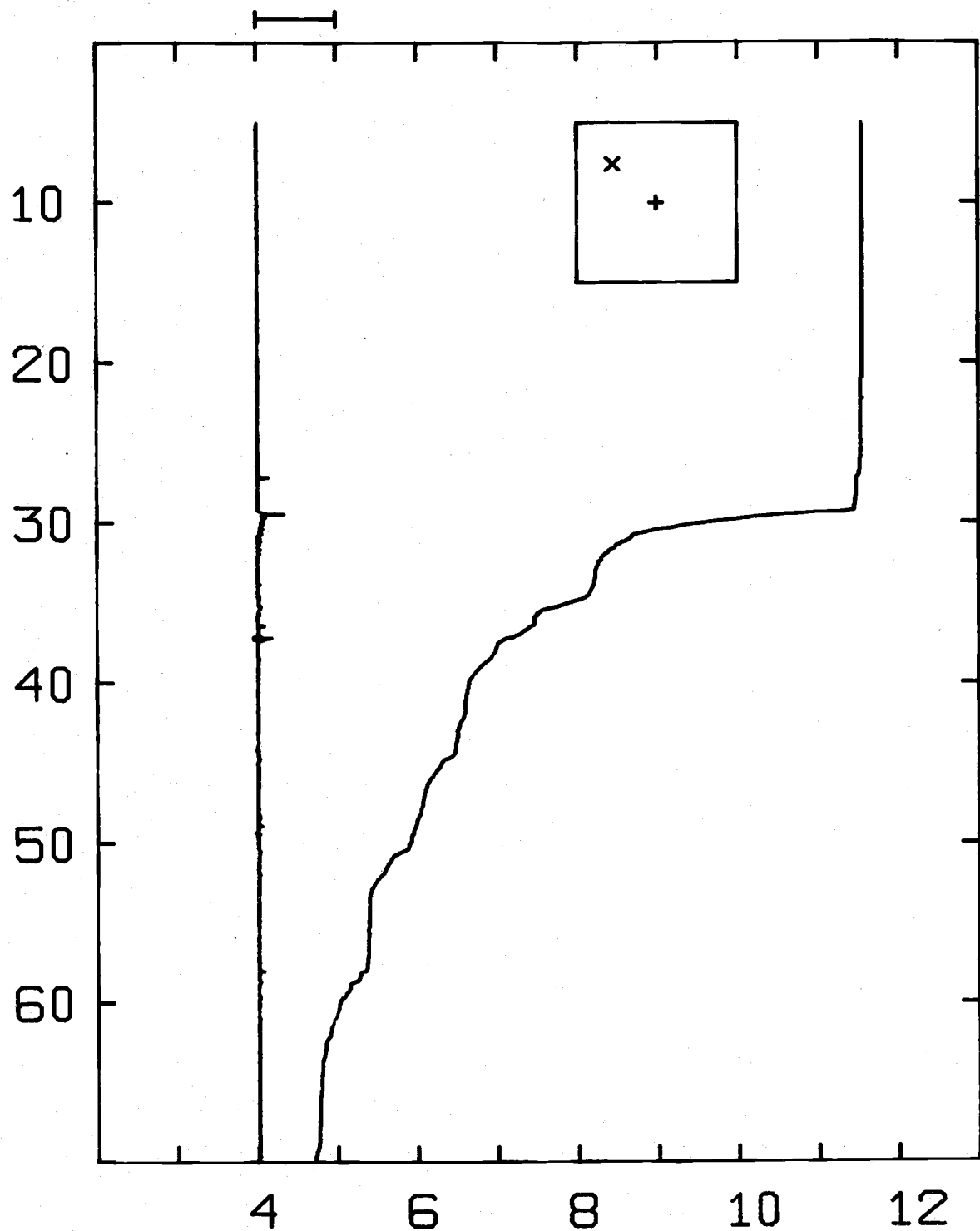
DATE 8/24/77

RANGE 3.54

TIME 1245

BEARING 131

30.0 DEG/M UNIT A P823E3



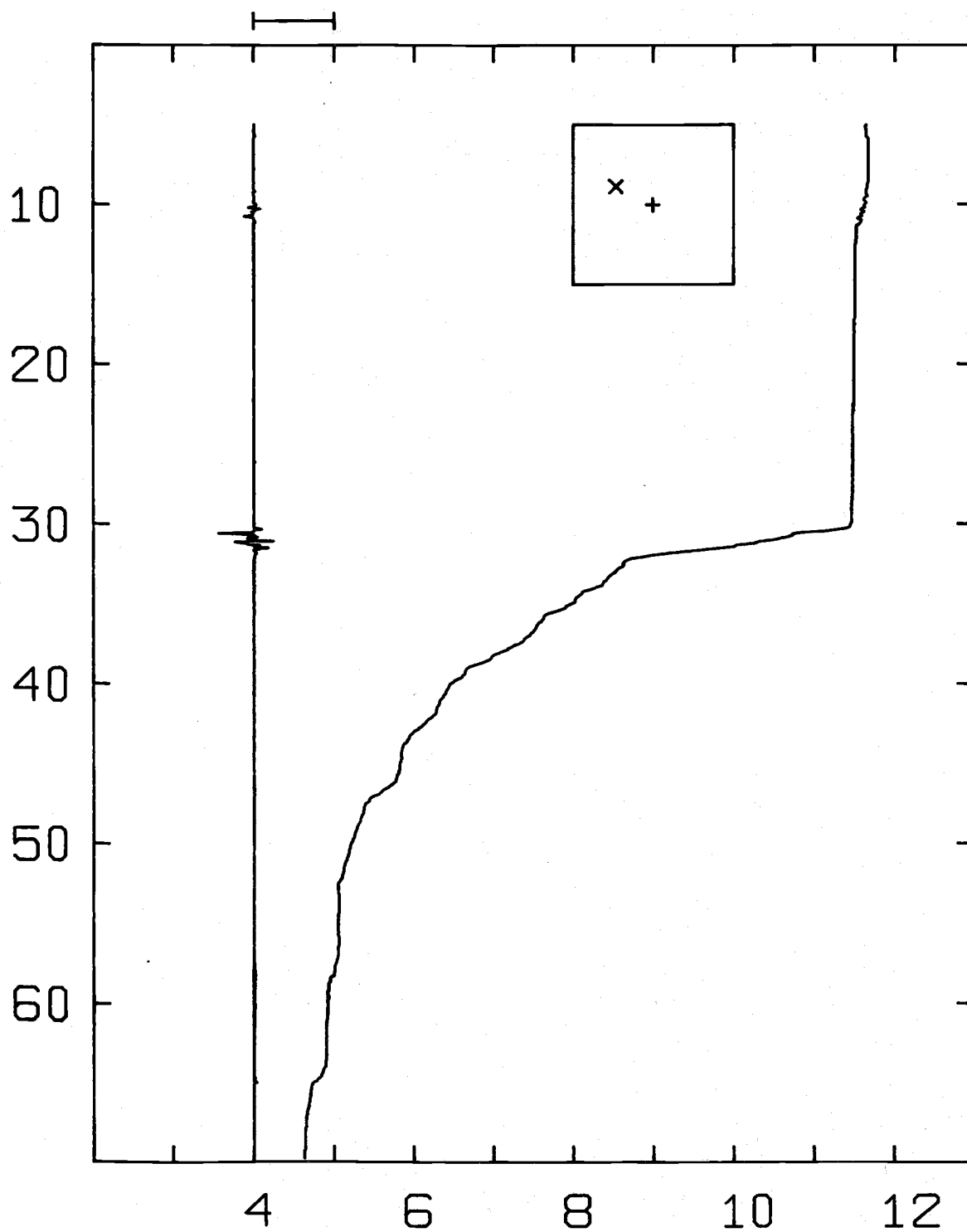
DATE 8/24/77

RANGE 3.63

TIME 1257

BEARING 131

100. DEG/M UNIT A P824A1



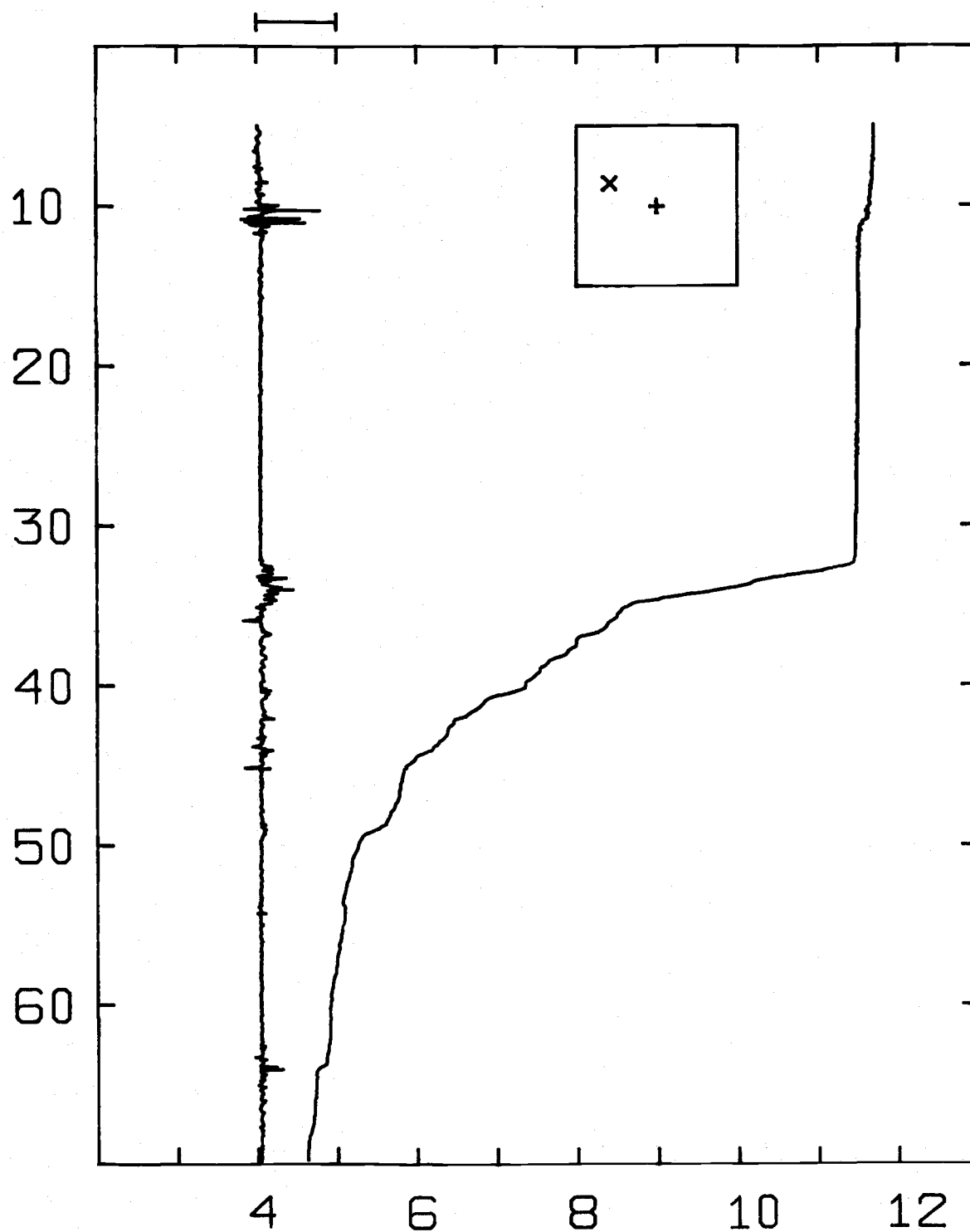
DATE 8/25/77

RANGE 2.59

TIME 0545

BEARING 116

10.0 DEG/M UNIT A P824A2



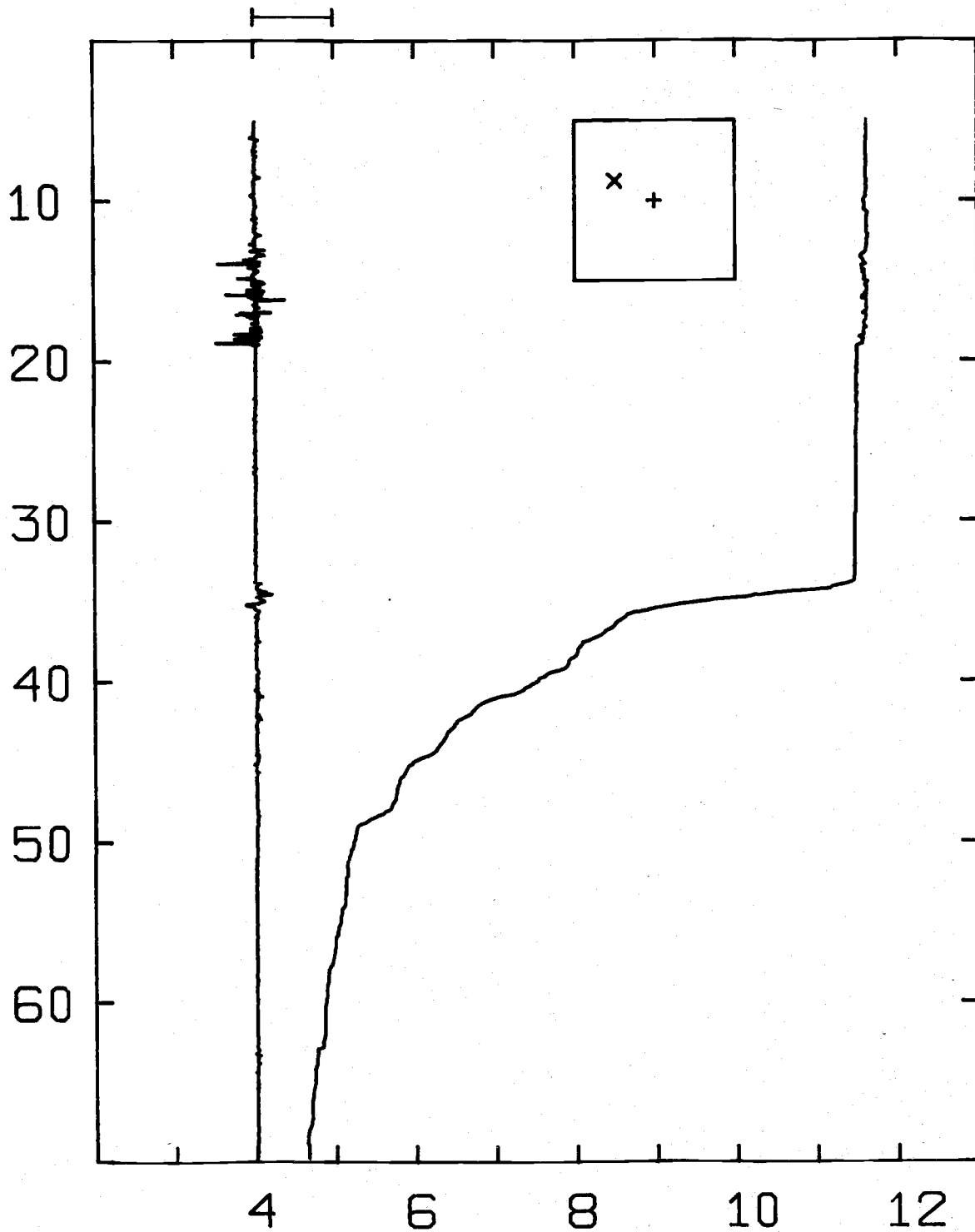
DATE 8/25/77

RANGE 3.22

TIME 0600

BEARING 115

30.0 DEG/M UNIT A P824A3



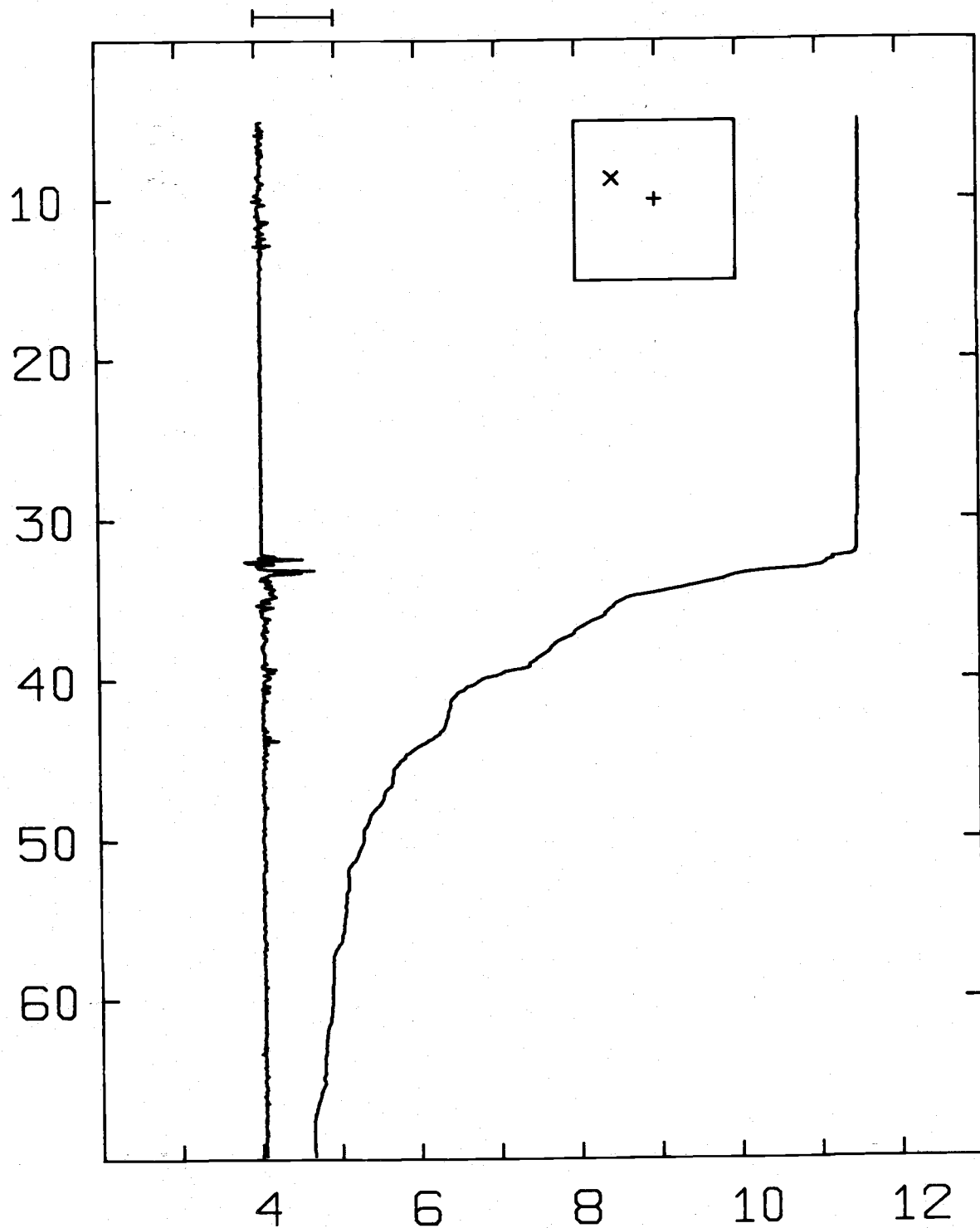
DATE 8/25/77

RANGE 2.78

TIME 0622

BEARING 116

10.0 DEG/M UNIT A P824B1



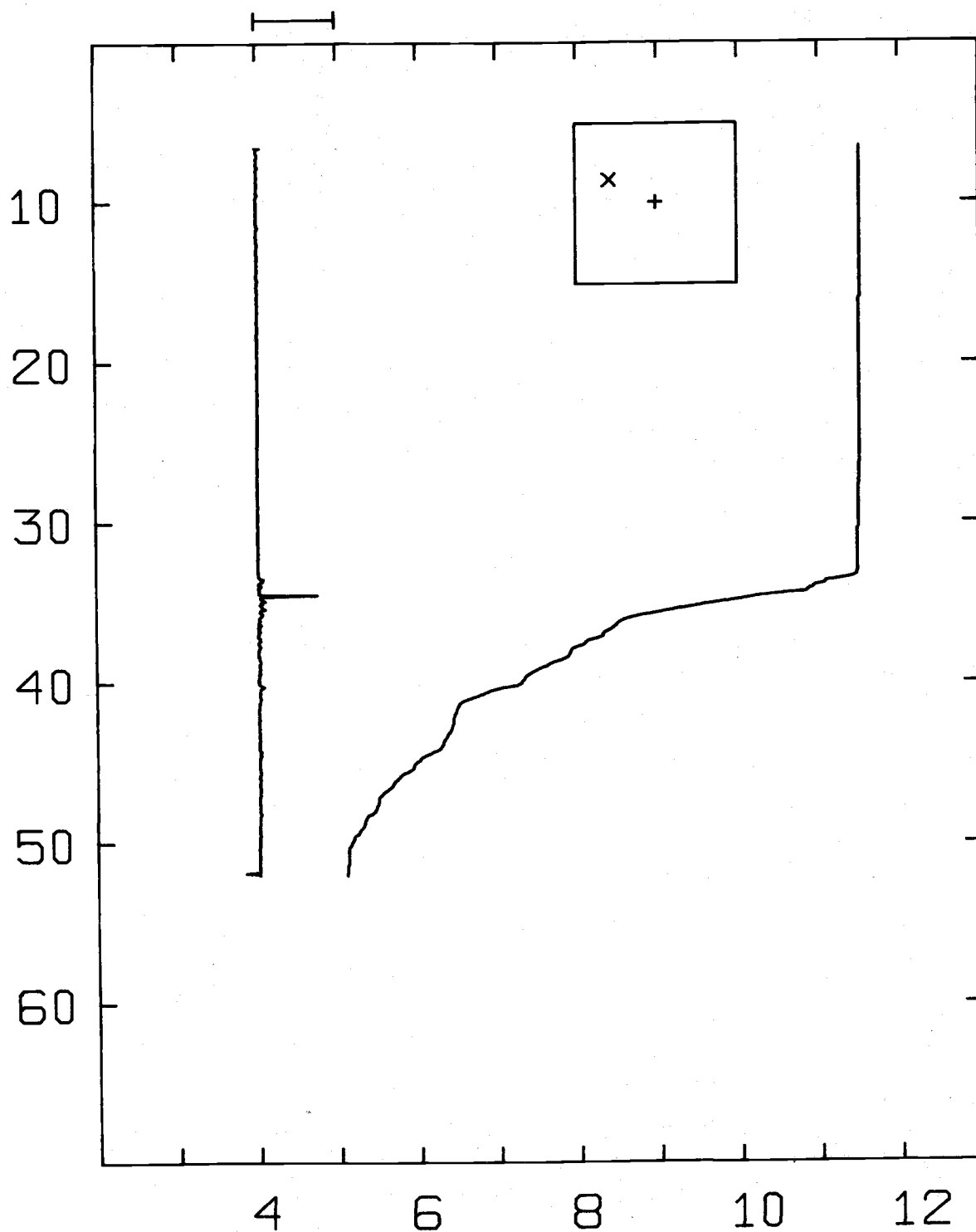
DATE 8/25/77

RANGE 3.00

TIME 0639

BEARING 116

30.0 DEG/M UNIT A P824B2



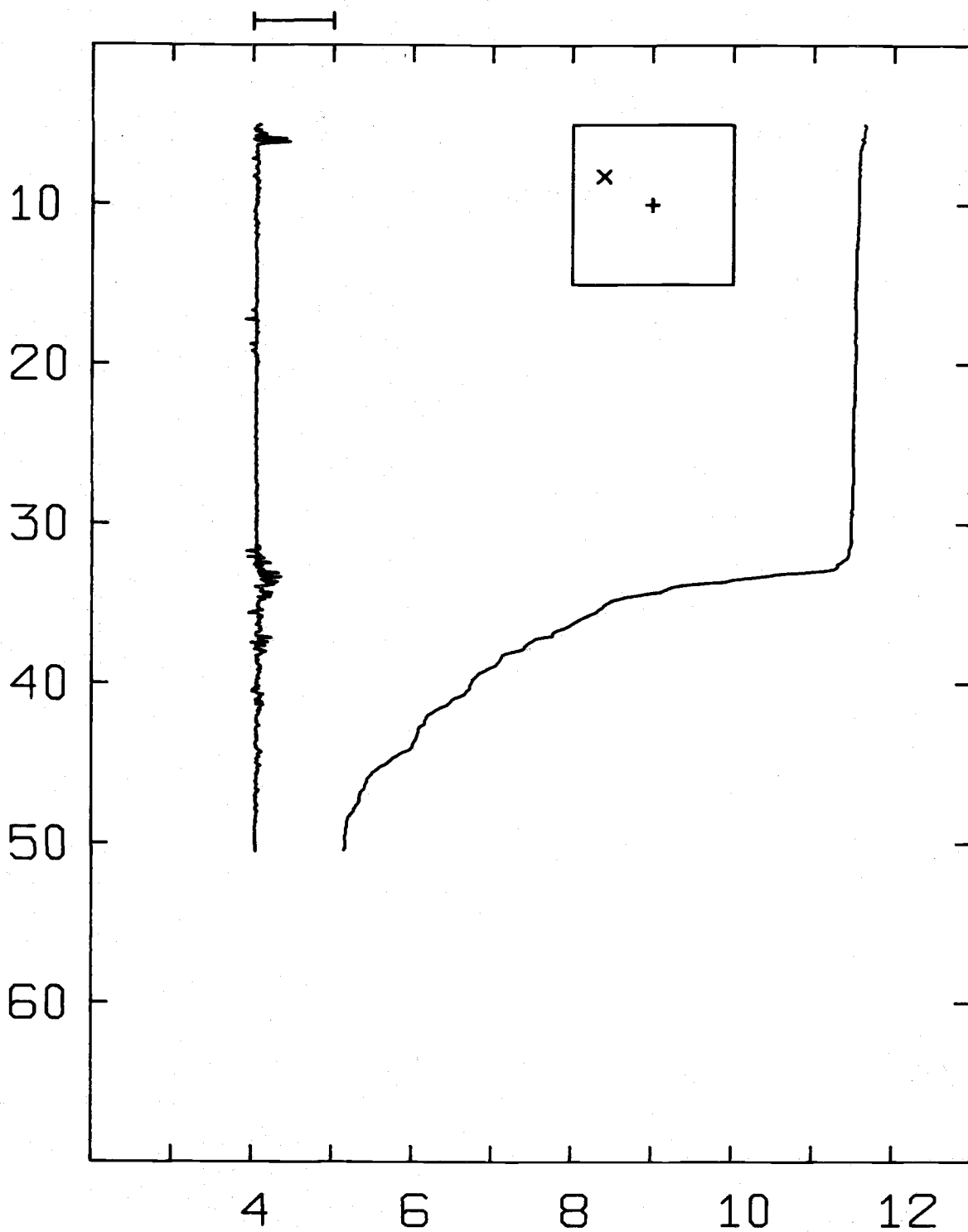
DATE 8/25/77

RANGE 3.22

TIME 0656

BEARING 116

10.0 DEG/M UNIT A P824C1



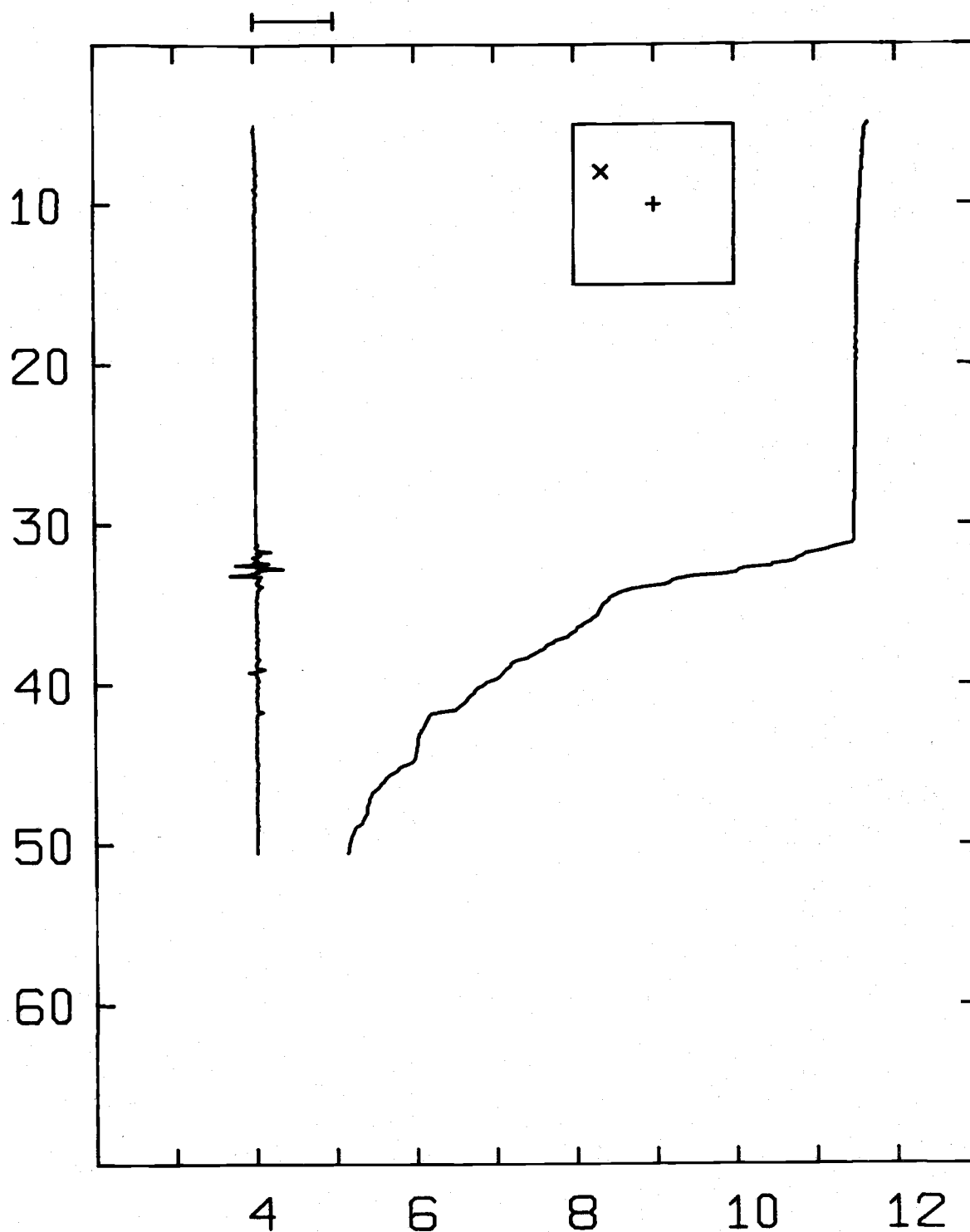
DATE 8/25/77

RANGE 3.52

TIME 0741

BEARING 120

30.0 DEG/M UNIT A P824C2



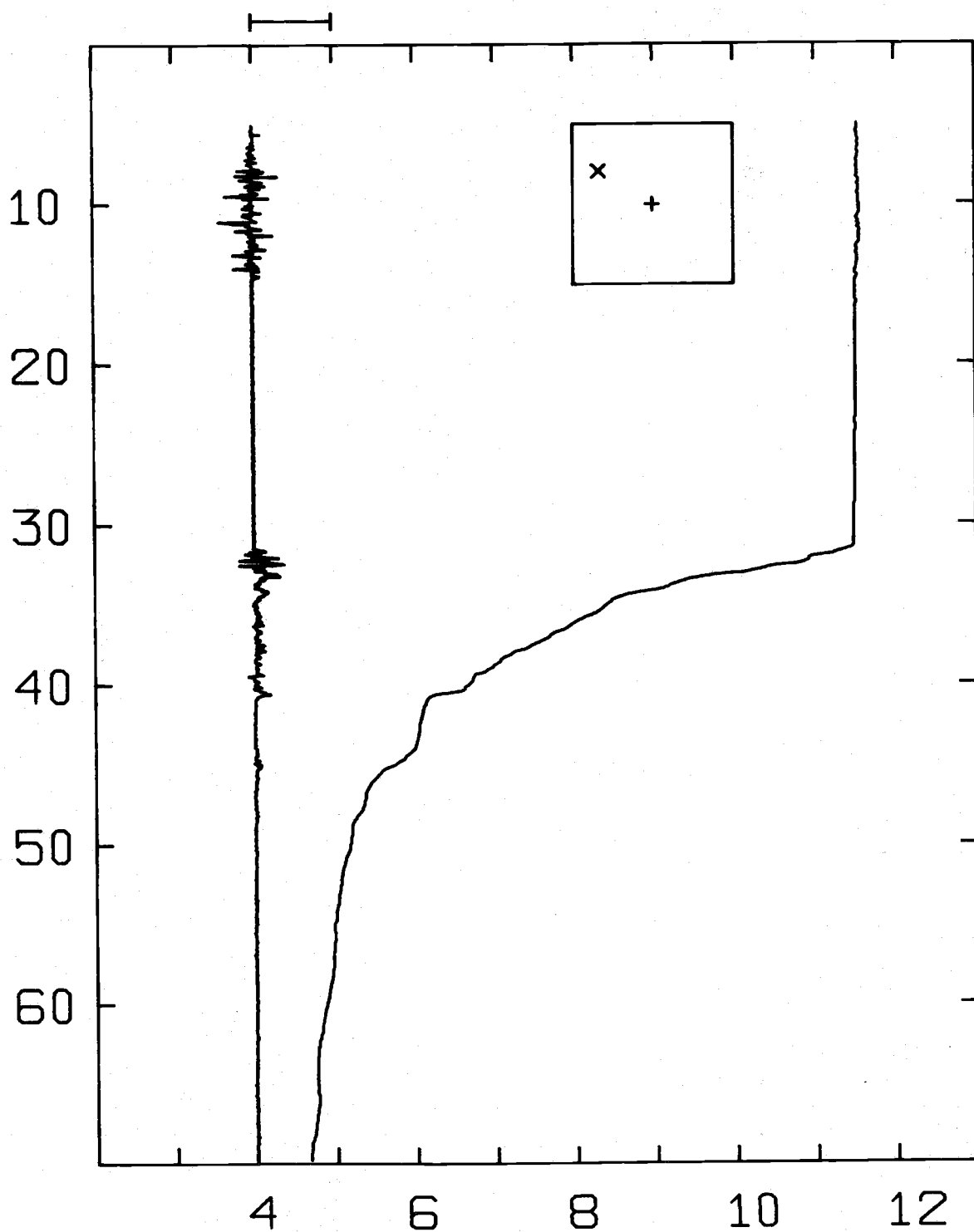
DATE 8/24/77

RANGE 3.85

TIME 0750

BEARING 121

10.0 DEG/M UNIT A P824C3



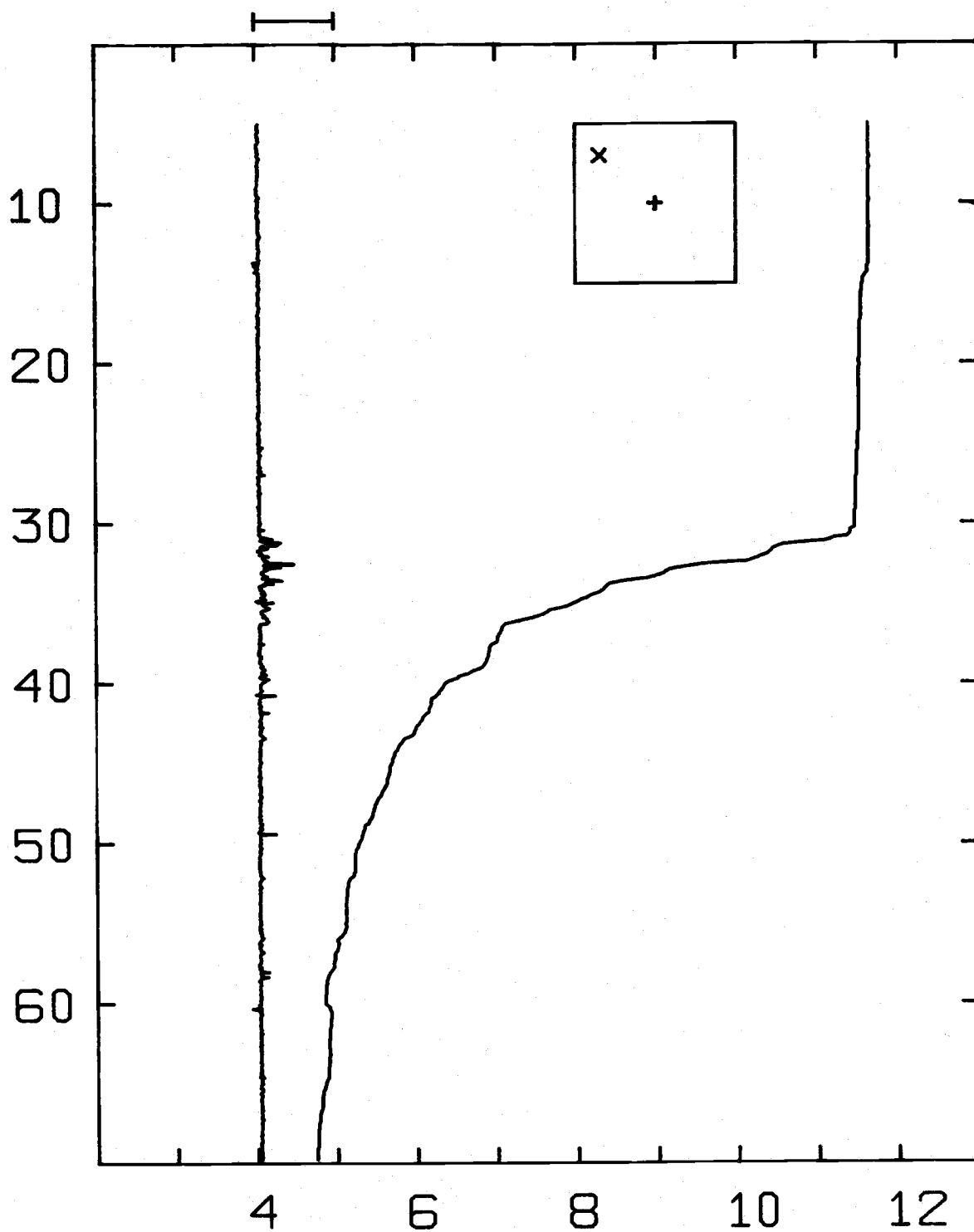
DATE 8/25/77

RANGE 3.97

TIME 0759

BEARING 121

10.0 DEG/M UNIT A PB24C4



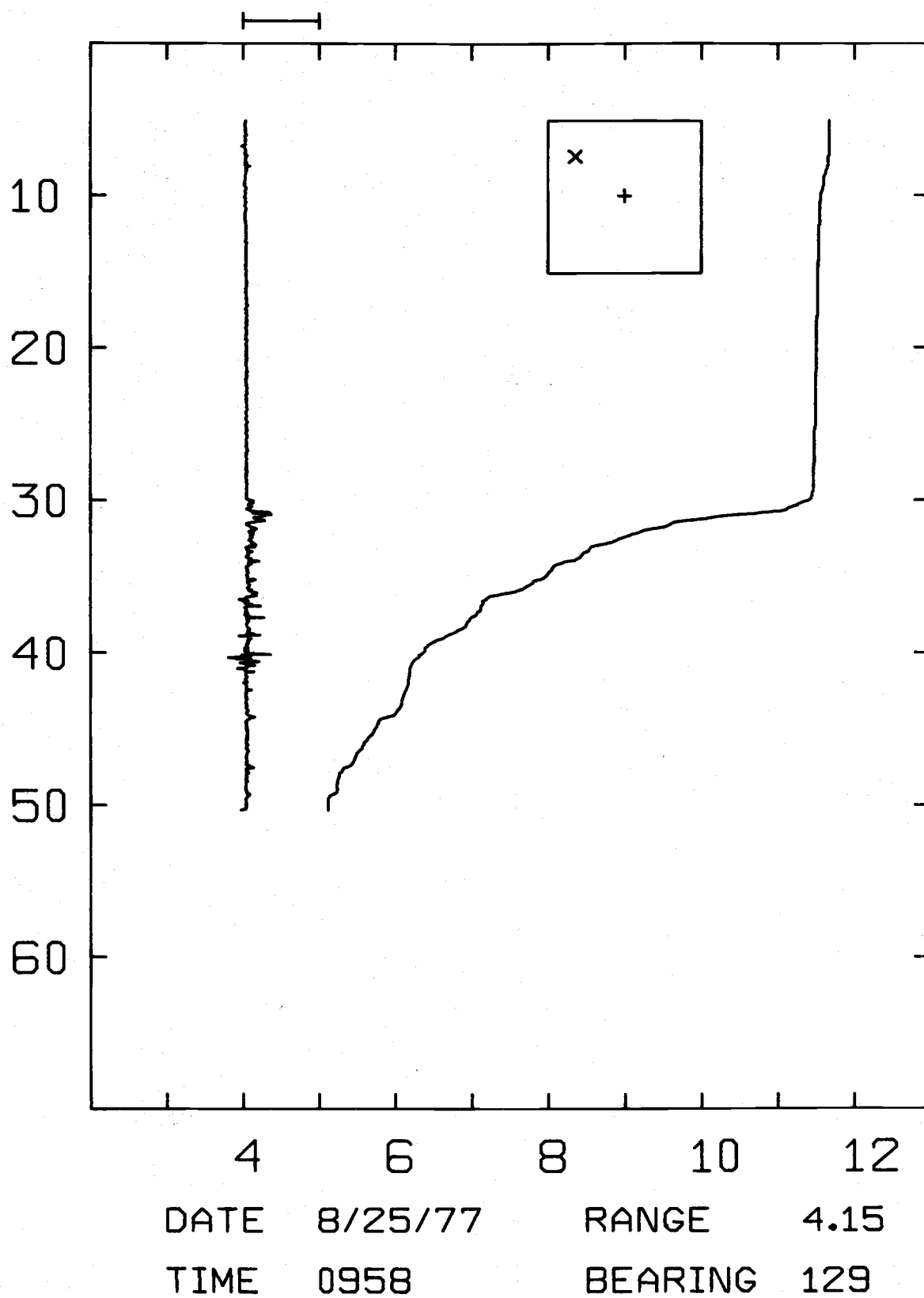
DATE 8/25/77

RANGE 4.61

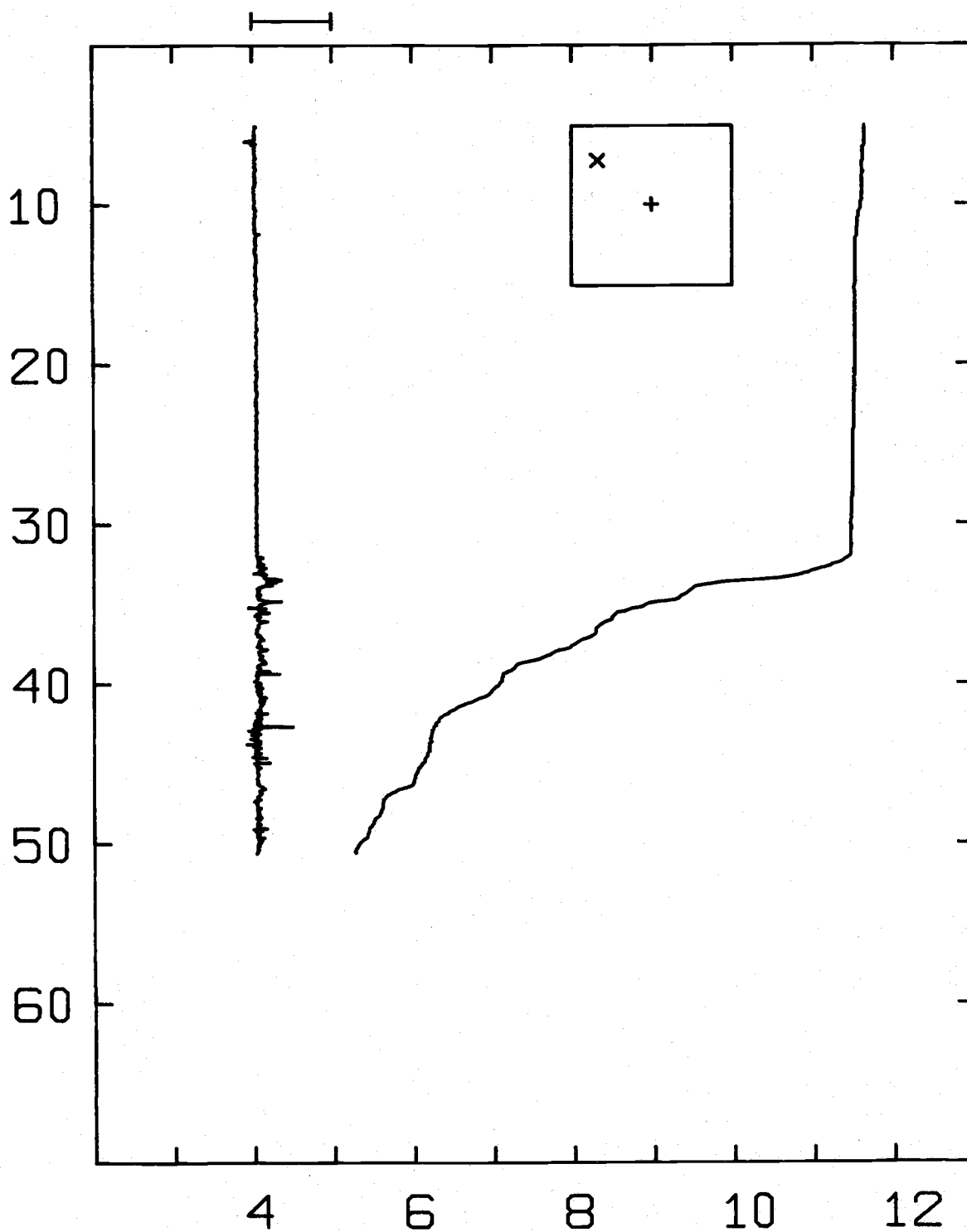
TIME 0940

BEARING 131

10.0 DEG/M UNIT A P824D1



10.0 DEG/M UNIT A P824D2



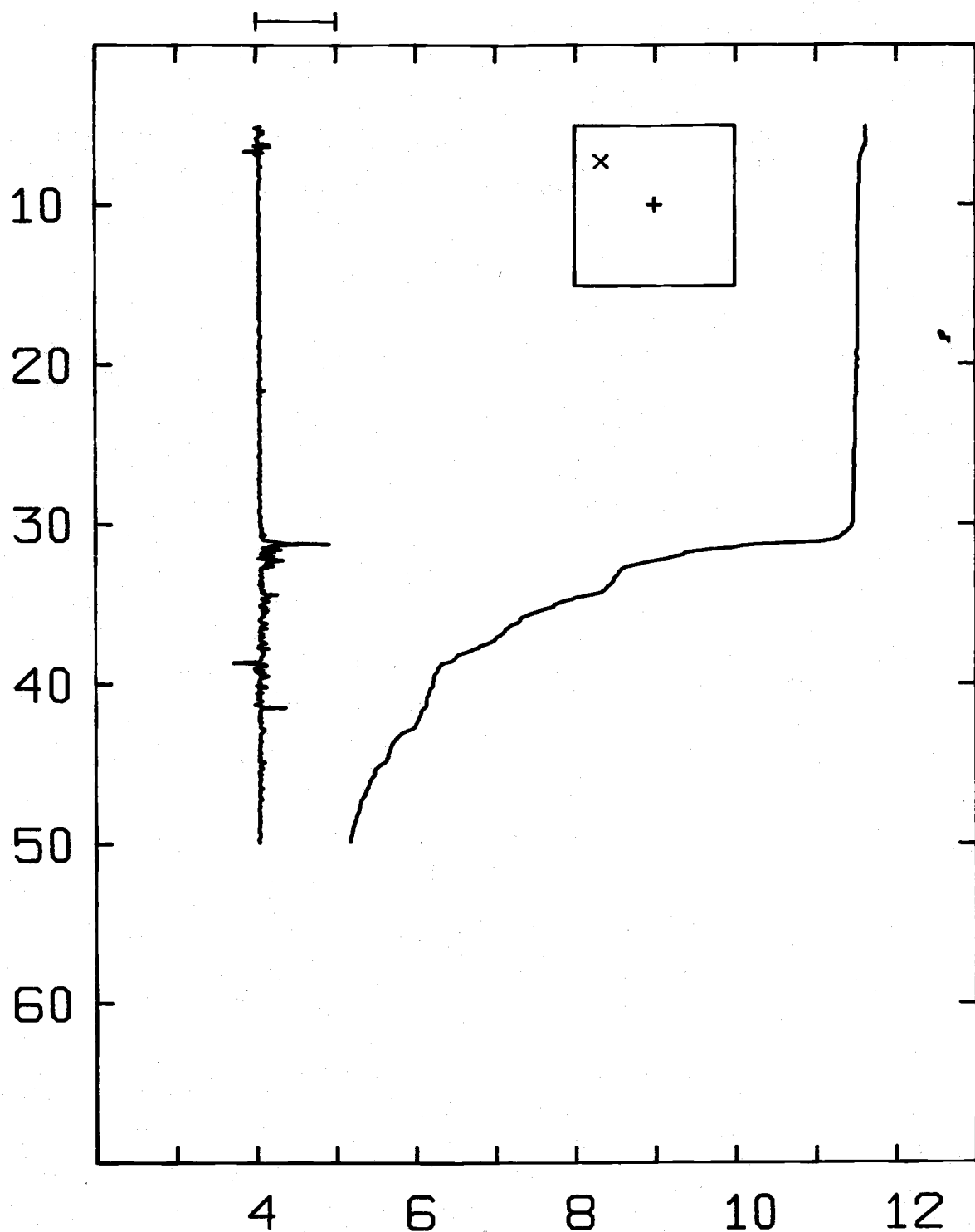
DATE 8/25/77

RANGE 4.37

TIME 1010

BEARING 129

10.0 DEG/M UNIT A P824D3



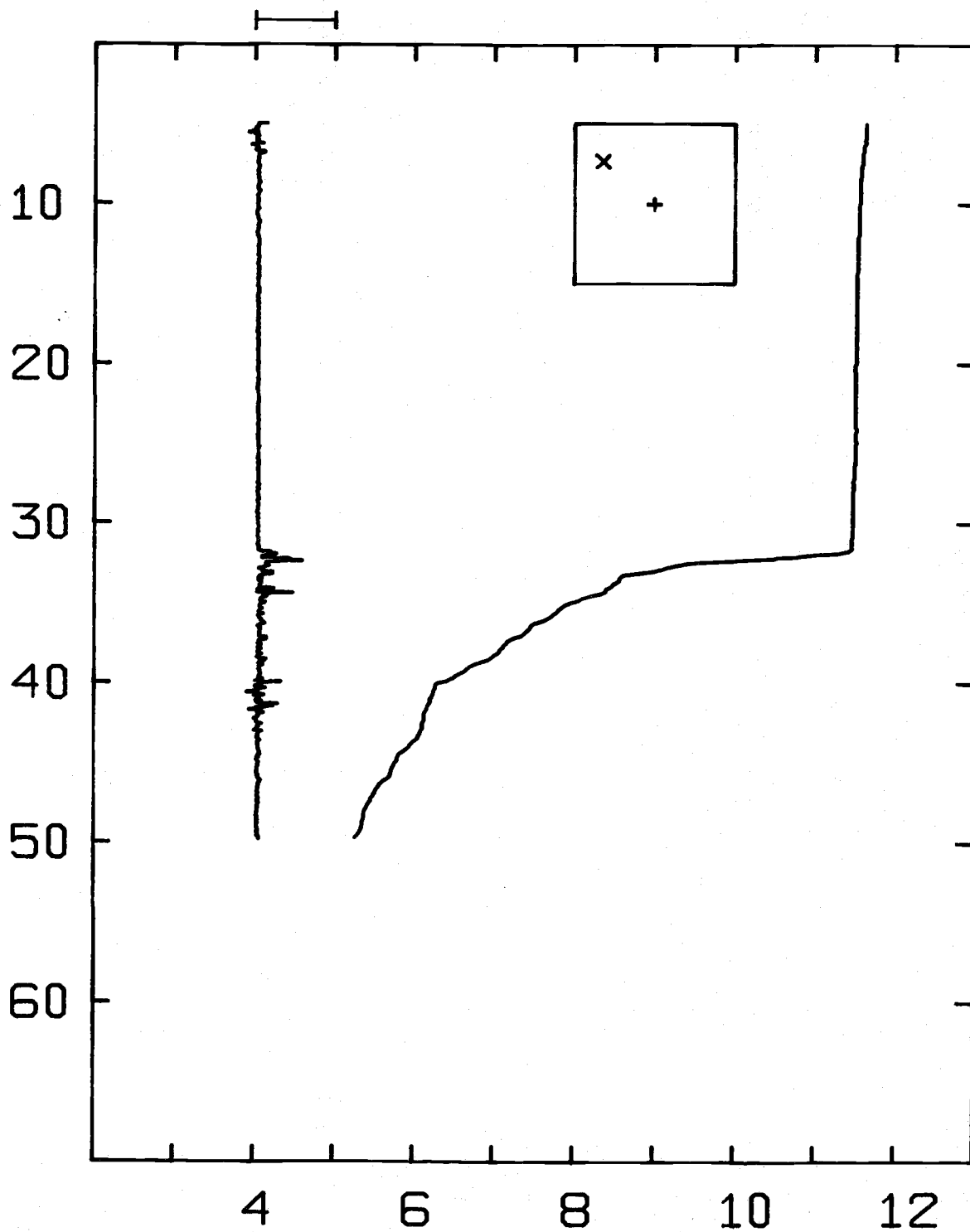
DATE 8/25/77

RANGE 4.30

TIME 1019

BEARING 129

10.0 DEG/M UNIT A P824D4



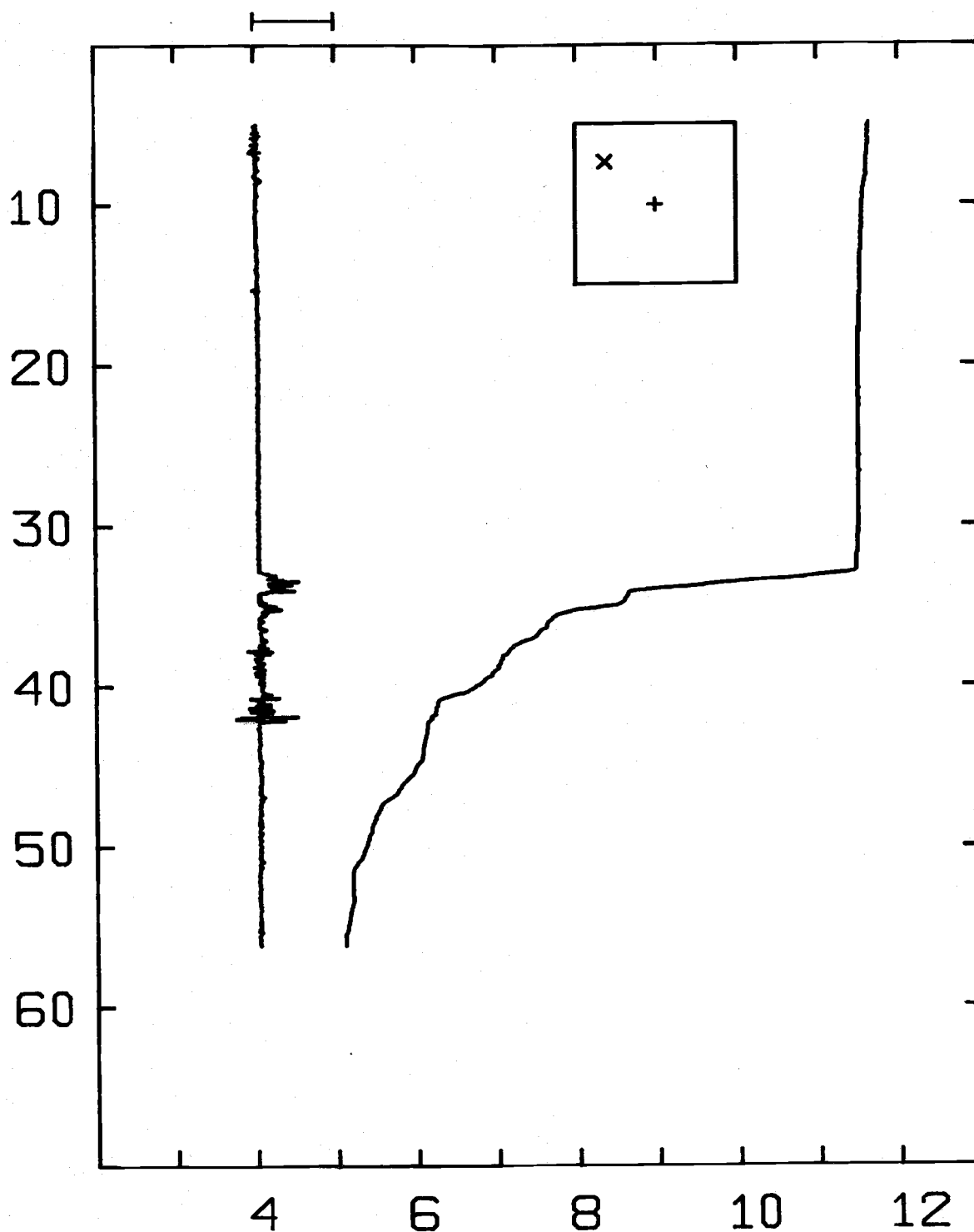
DATE 8/25/77

RANGE 4.23

TIME 1029

BEARING 130

10.0 DEG/M UNIT A P824D5



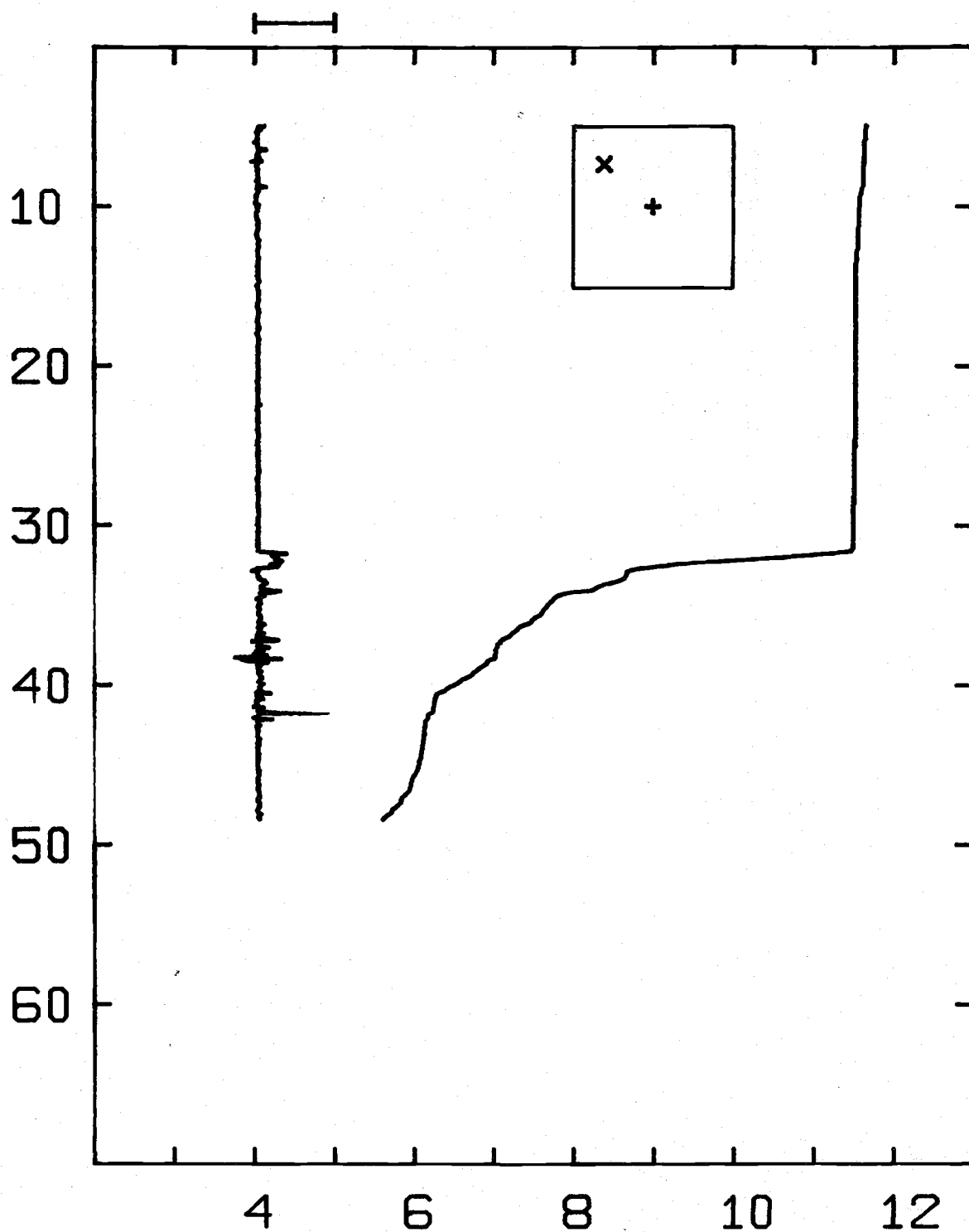
DATE 8/25/77

RANGE 4.11

TIME 1039

BEARING 130

10.0 DEG/M UNIT A P824D6



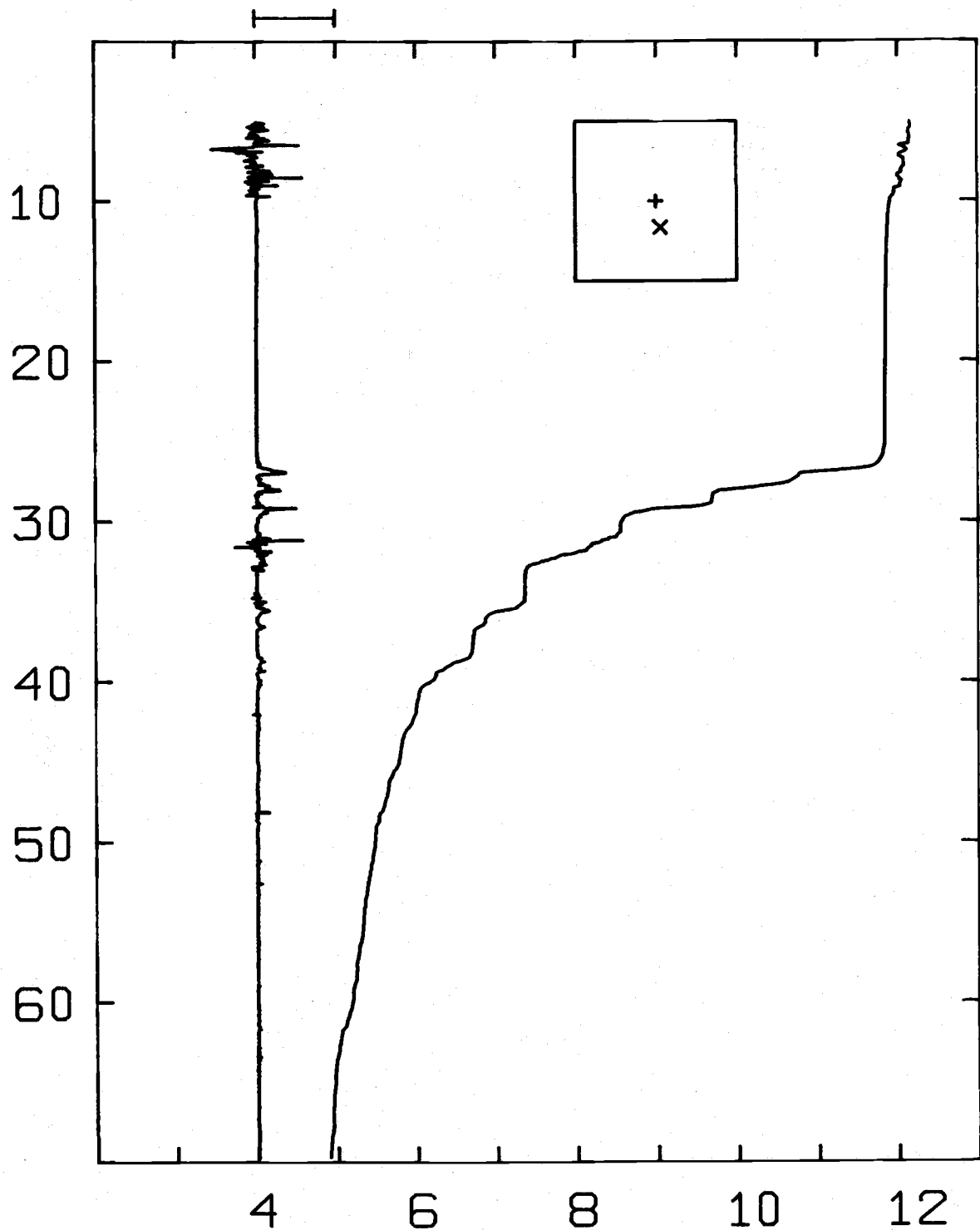
DATE 8/25/77

RANGE 4.02

TIME 1050

BEARING 131

10.0 DEG/M UNIT D P825A2



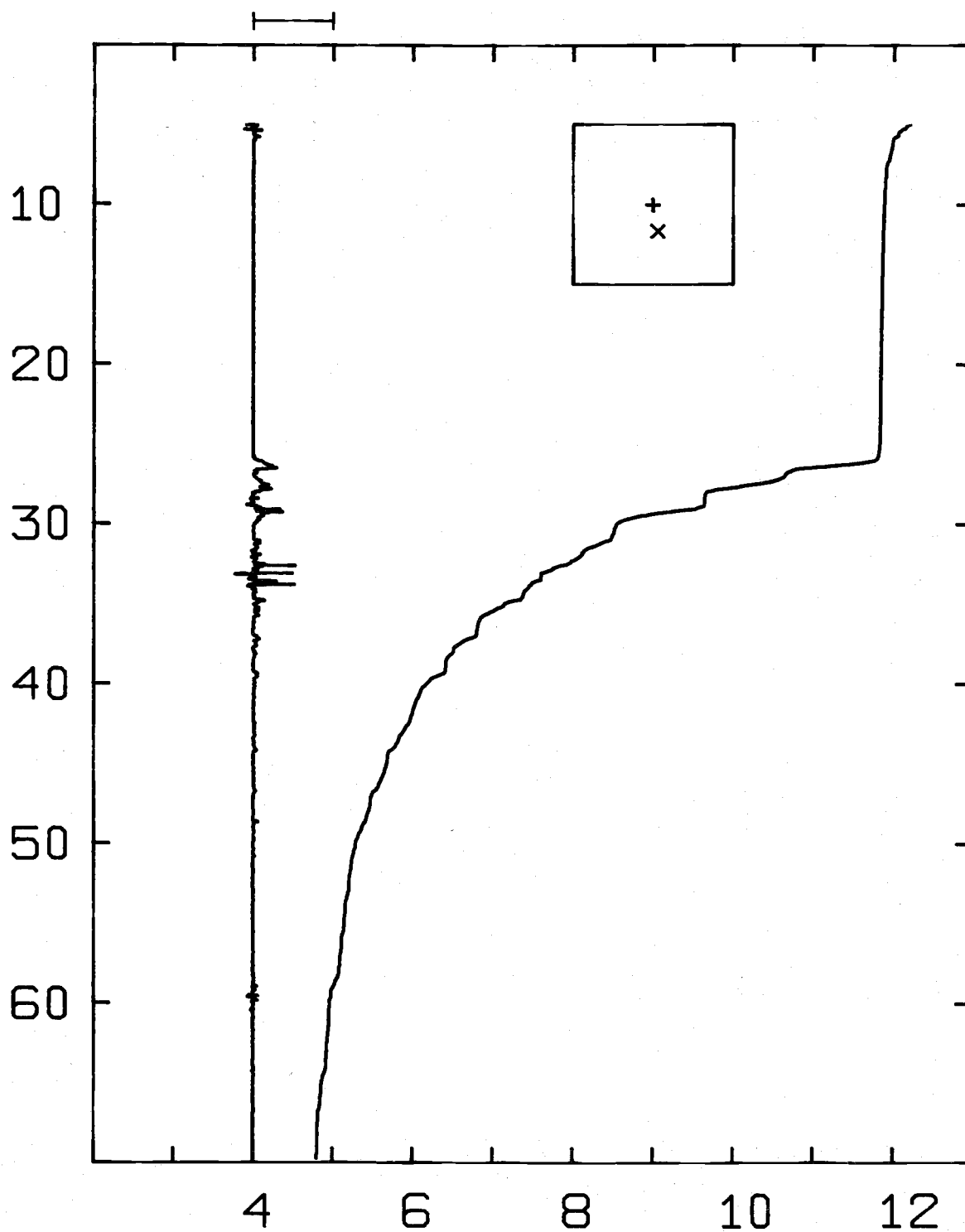
DATE 8/26/77

RANGE 1.67

TIME 0605

BEARING 351

10.0 DEG/M UNIT D P825A3



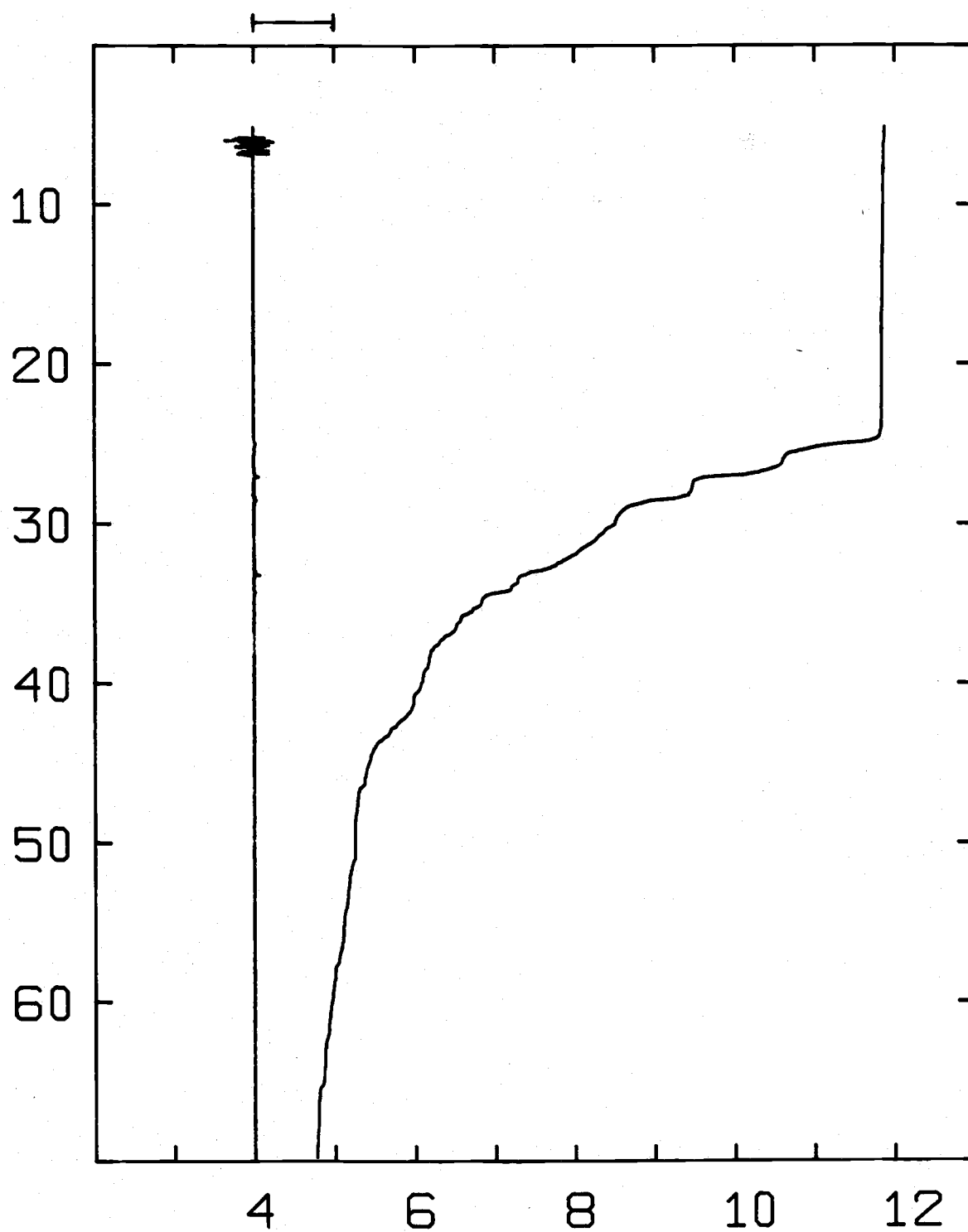
DATE 8/26/77

RANGE 1.72

TIME 0630

BEARING 350

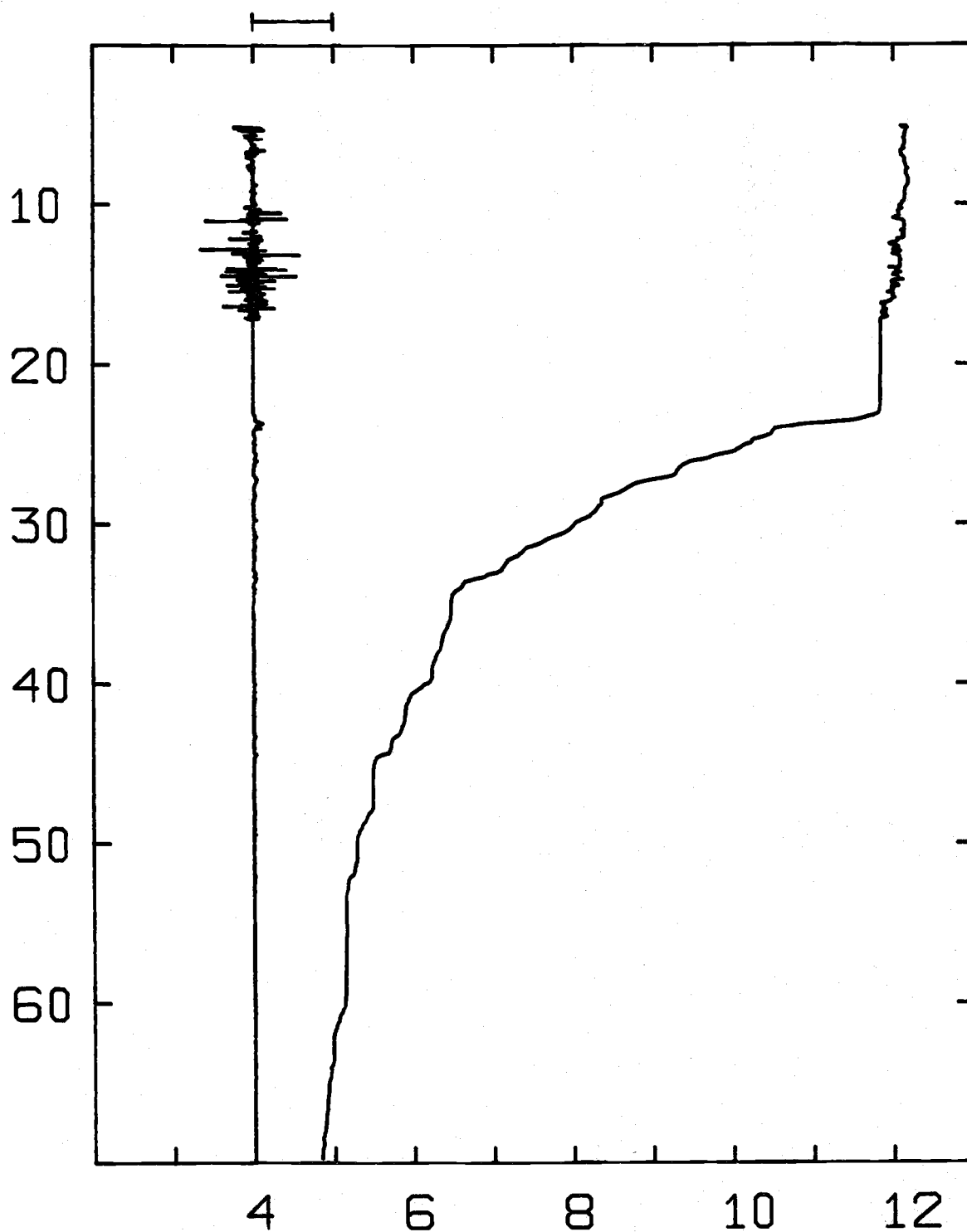
100. DEG/M UNIT D P825B1



DATE 8/26/77

TIME 0650

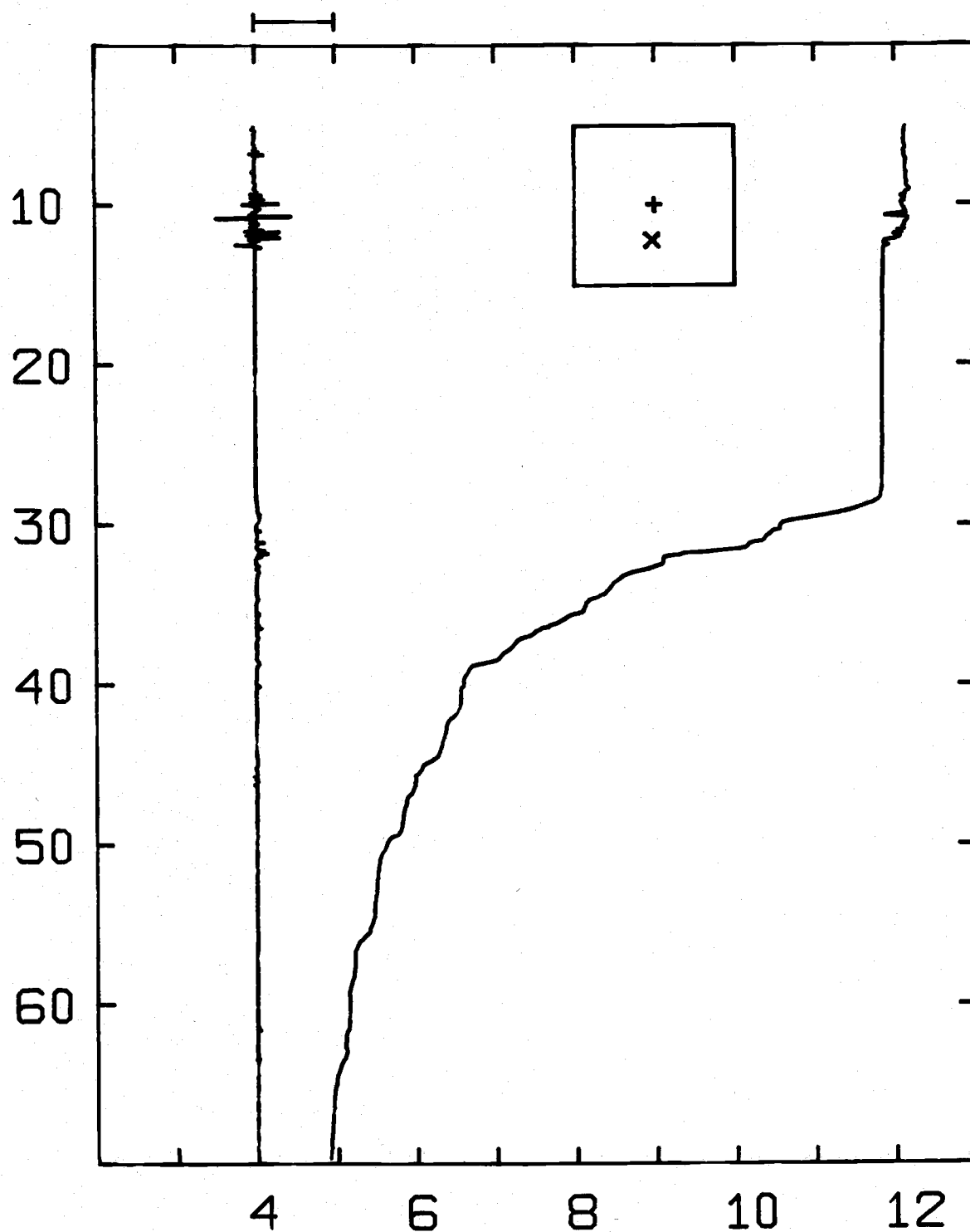
30.0 DEG/M UNIT D P825B2



DATE 8/26/77

TIME 0713

30.0 DEG/M UNIT D P825B4



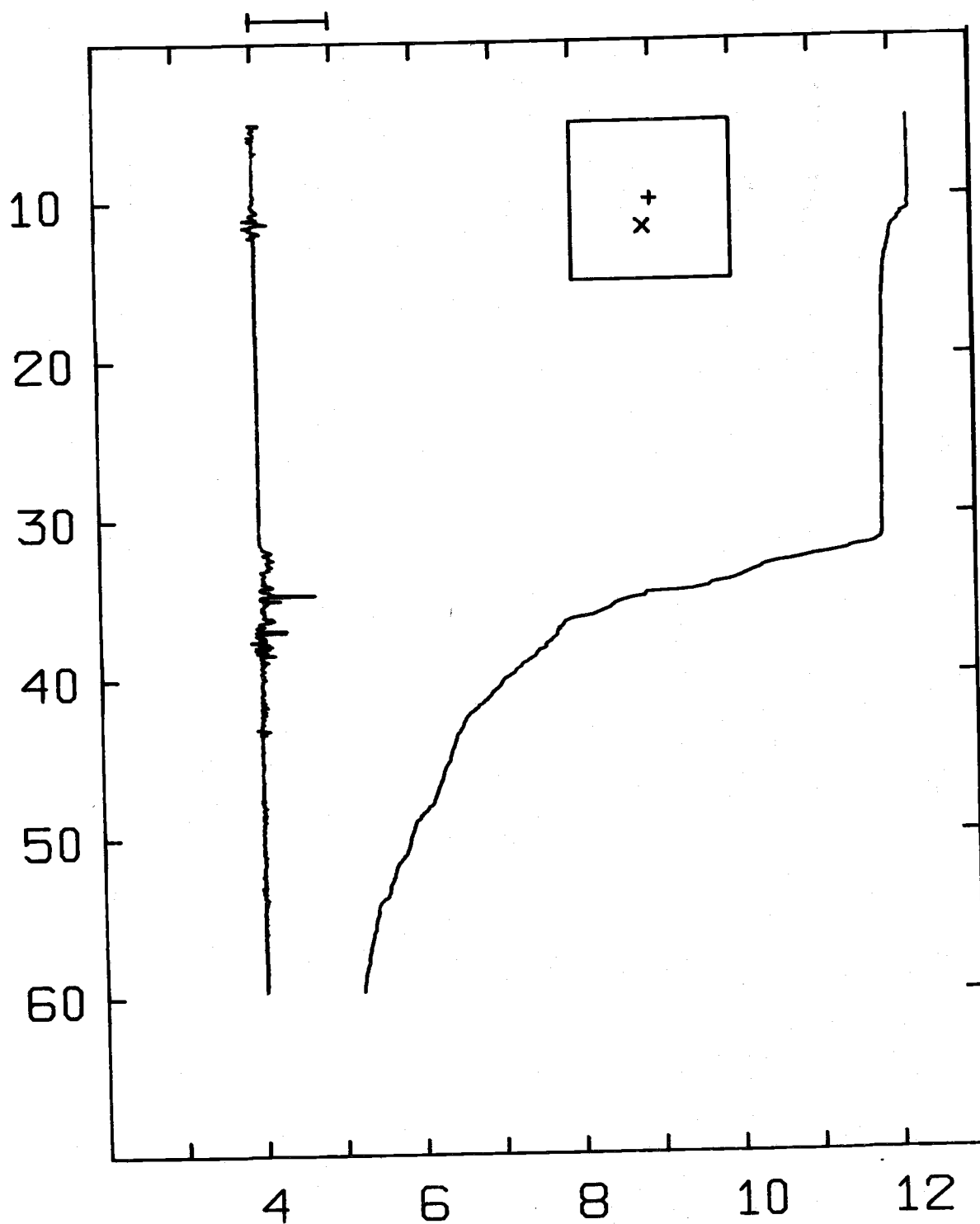
DATE 8/26/77

RANGE 2.22

TIME 0737

BEARING 4

10.0 DEG/M UNIT D P825C1



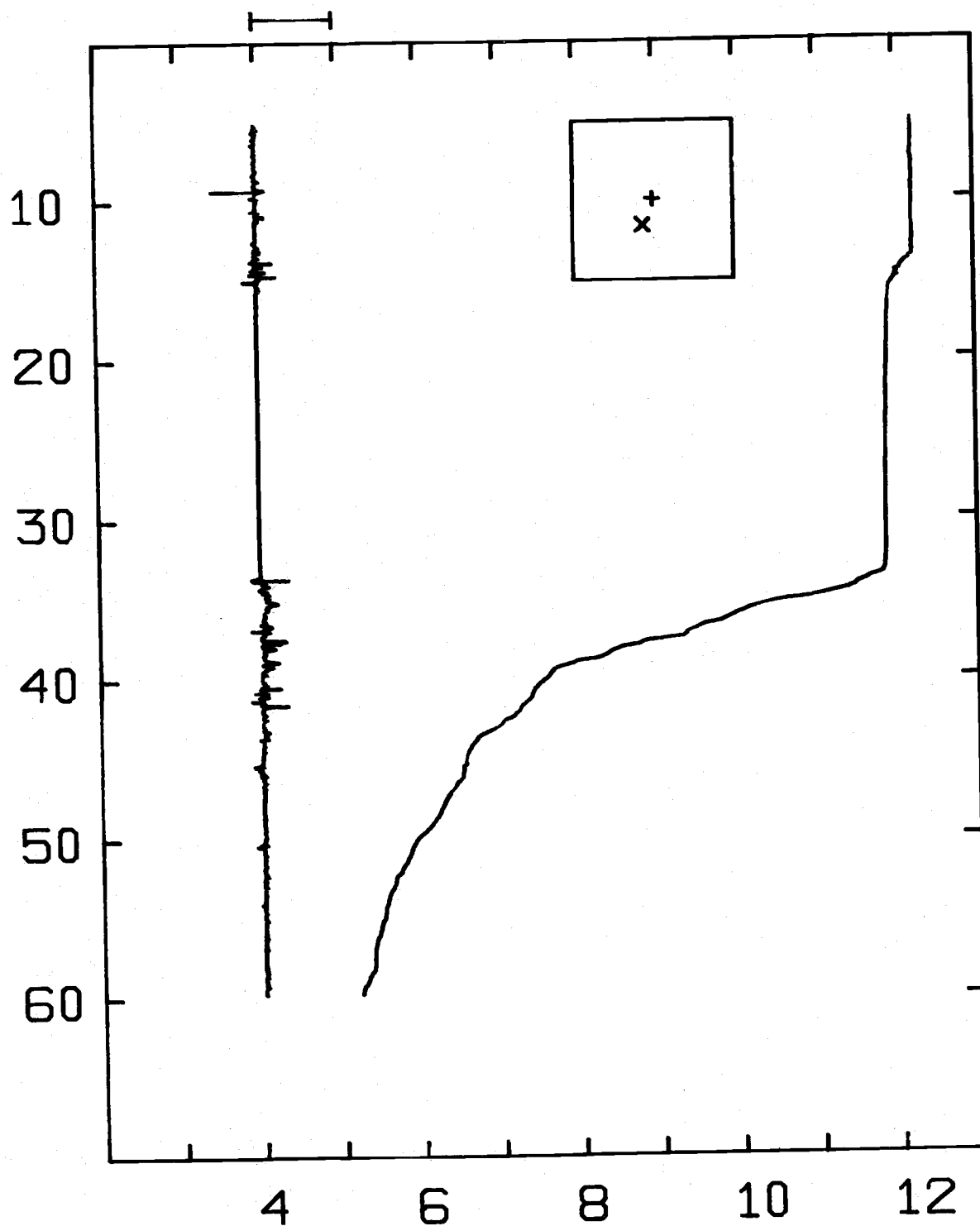
DATE 8/26/77

RANGE 1.80

TIME 0830

BEARING 16

10.0 DEG/M UNIT D P825C2



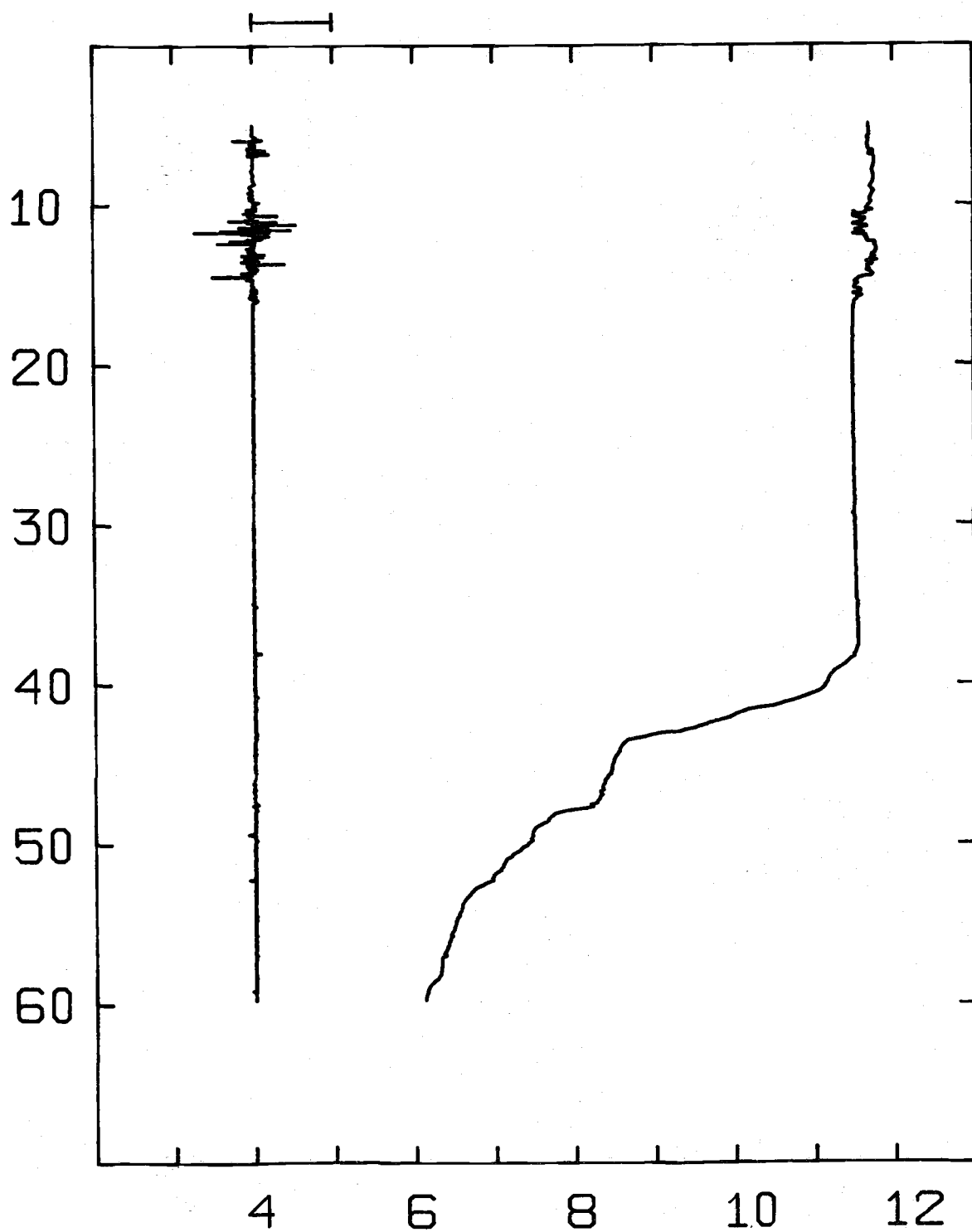
DATE 8/26/77

RANGE 1.74

TIME 0847

BEARING 21

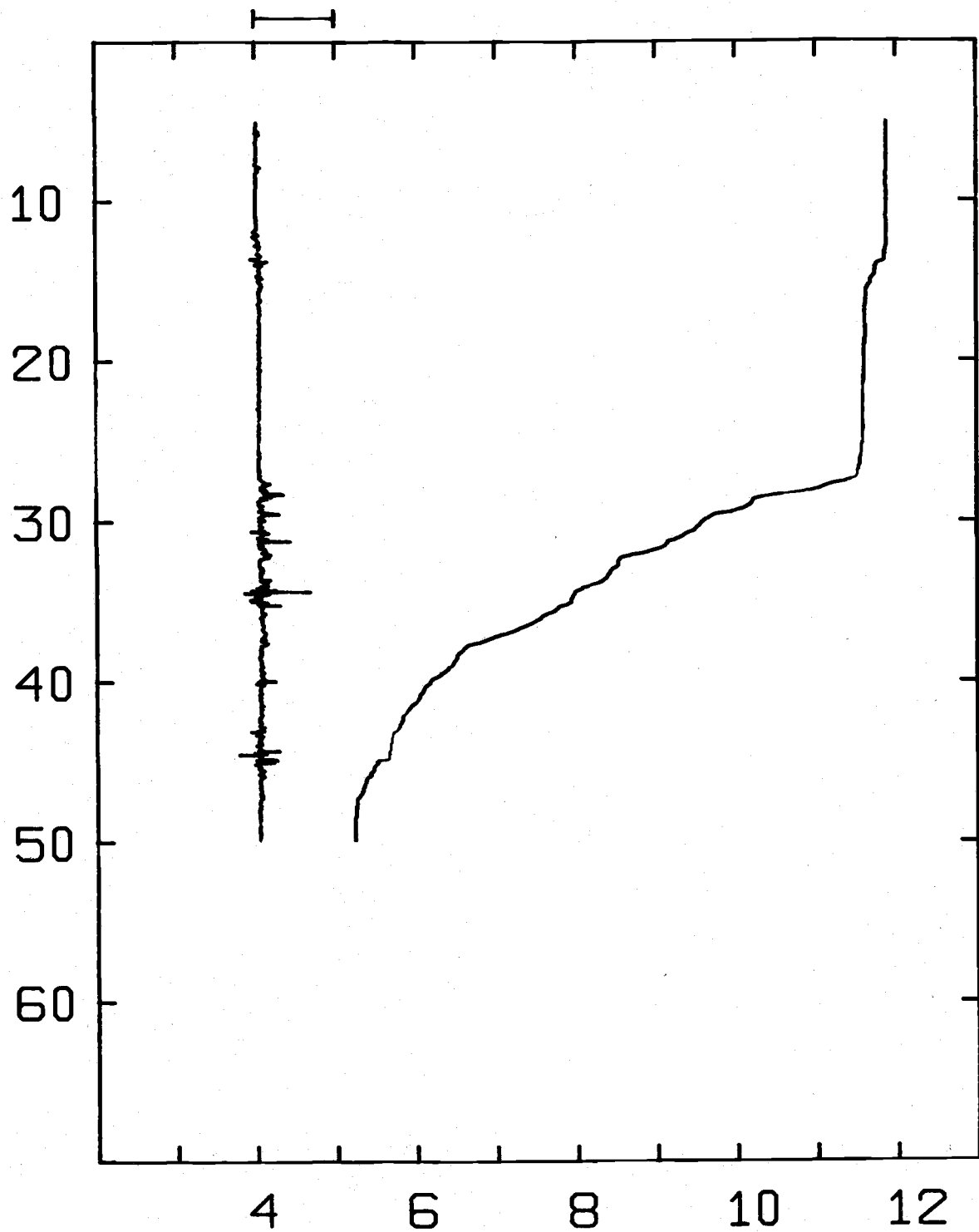
100. DEG/M UNIT C P825C4



DATE 8/26/77

TIME 0937

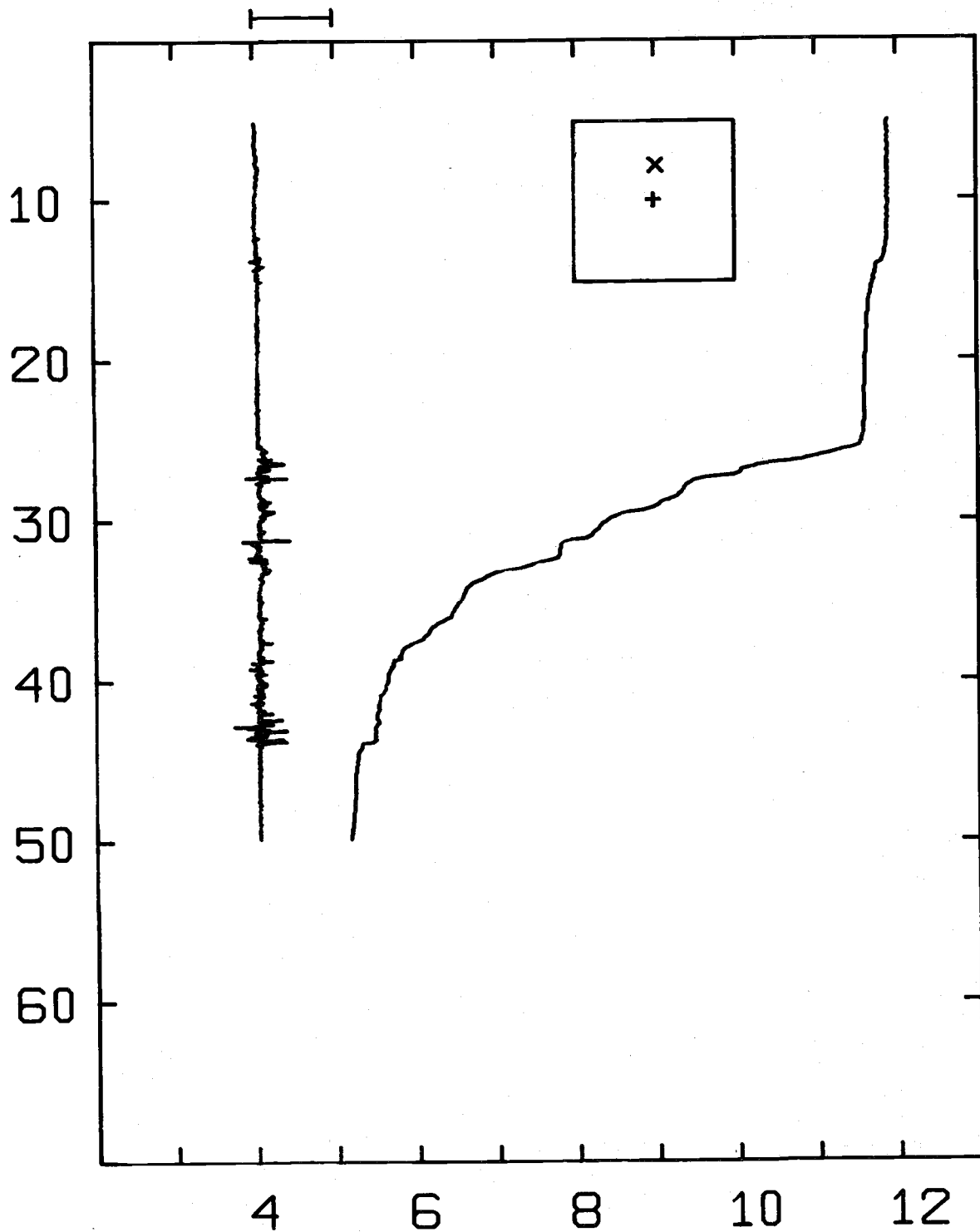
10.0 DEG/M UNIT A P826A3



DATE 8/27/77

TIME 0650

10.0 DEG/M UNIT A P826A4



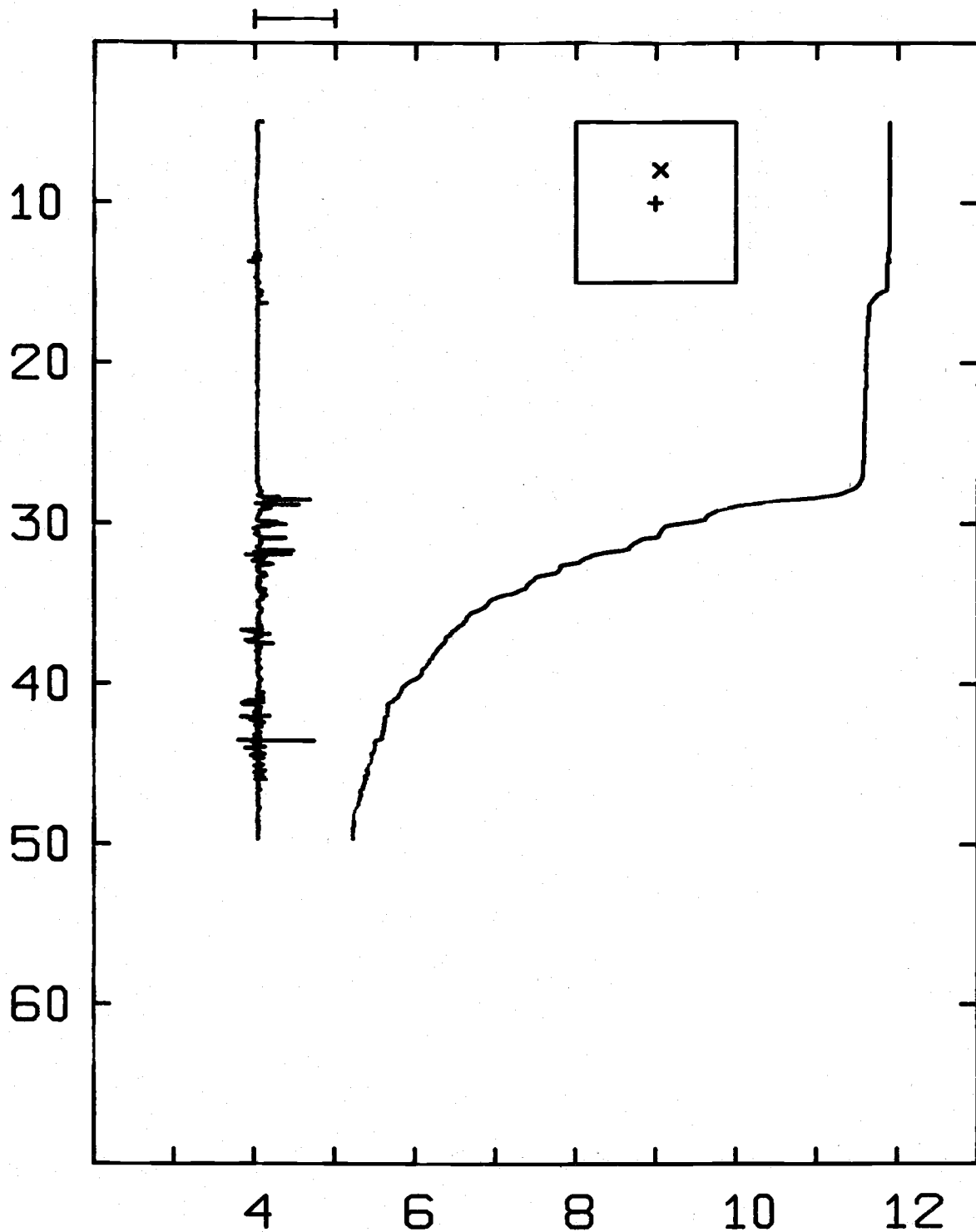
DATE 8/27/77

RANGE 2.15

TIME 0710

BEARING 183

10.0 DEG/M UNIT A P826A5



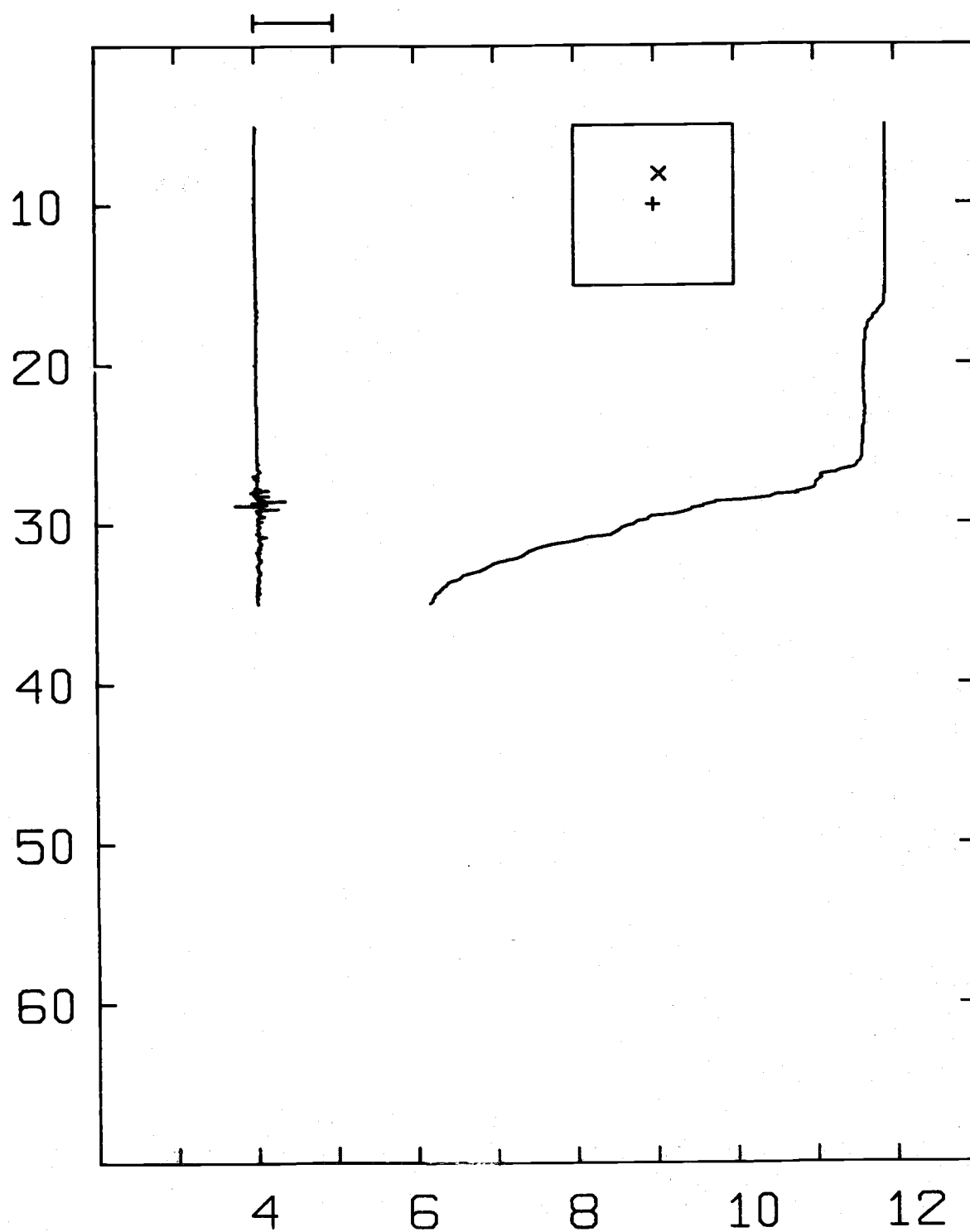
DATE 8/27/77

RANGE 2.08

TIME 0720

BEARING 188

30.0 DEG/M UNIT A P826B1



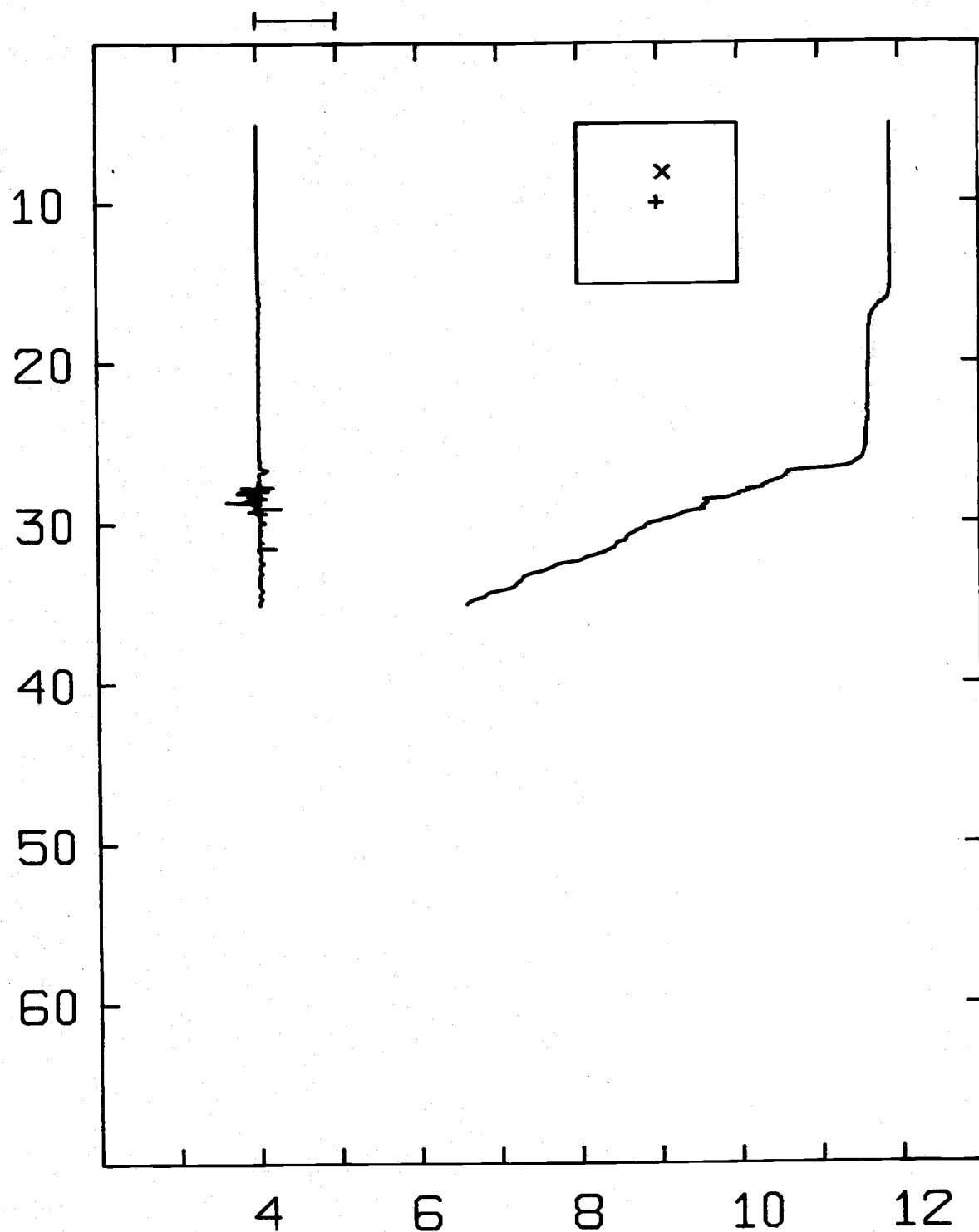
DATE 8/27/77

RANGE 1.98

TIME 0734

BEARING 190

30.0 DEG/M UNIT A P826B2



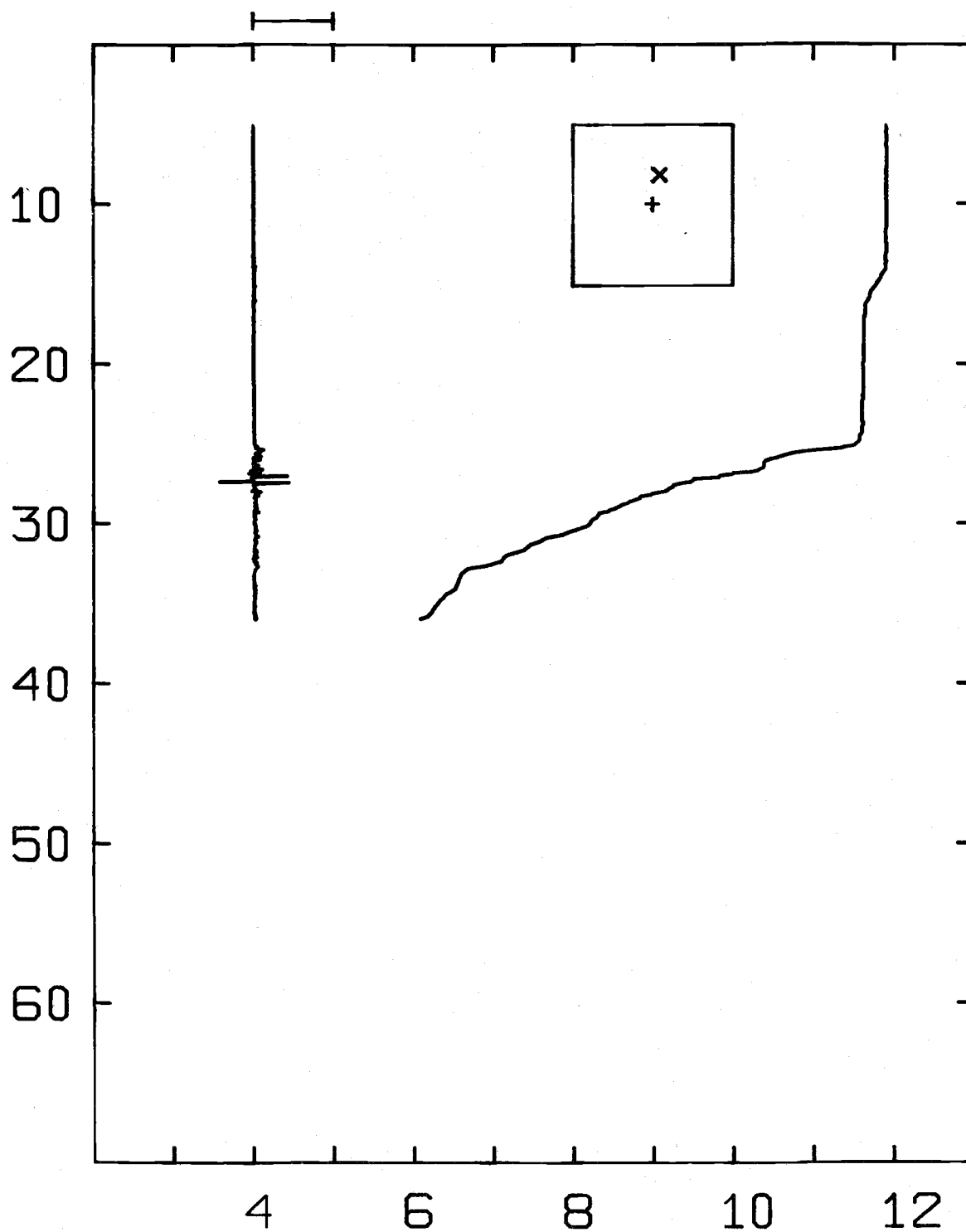
DATE 8/27/77

RANGE 1.96

TIME 0740

BEARING 191

30.0 DEG/M UNIT A P826B3



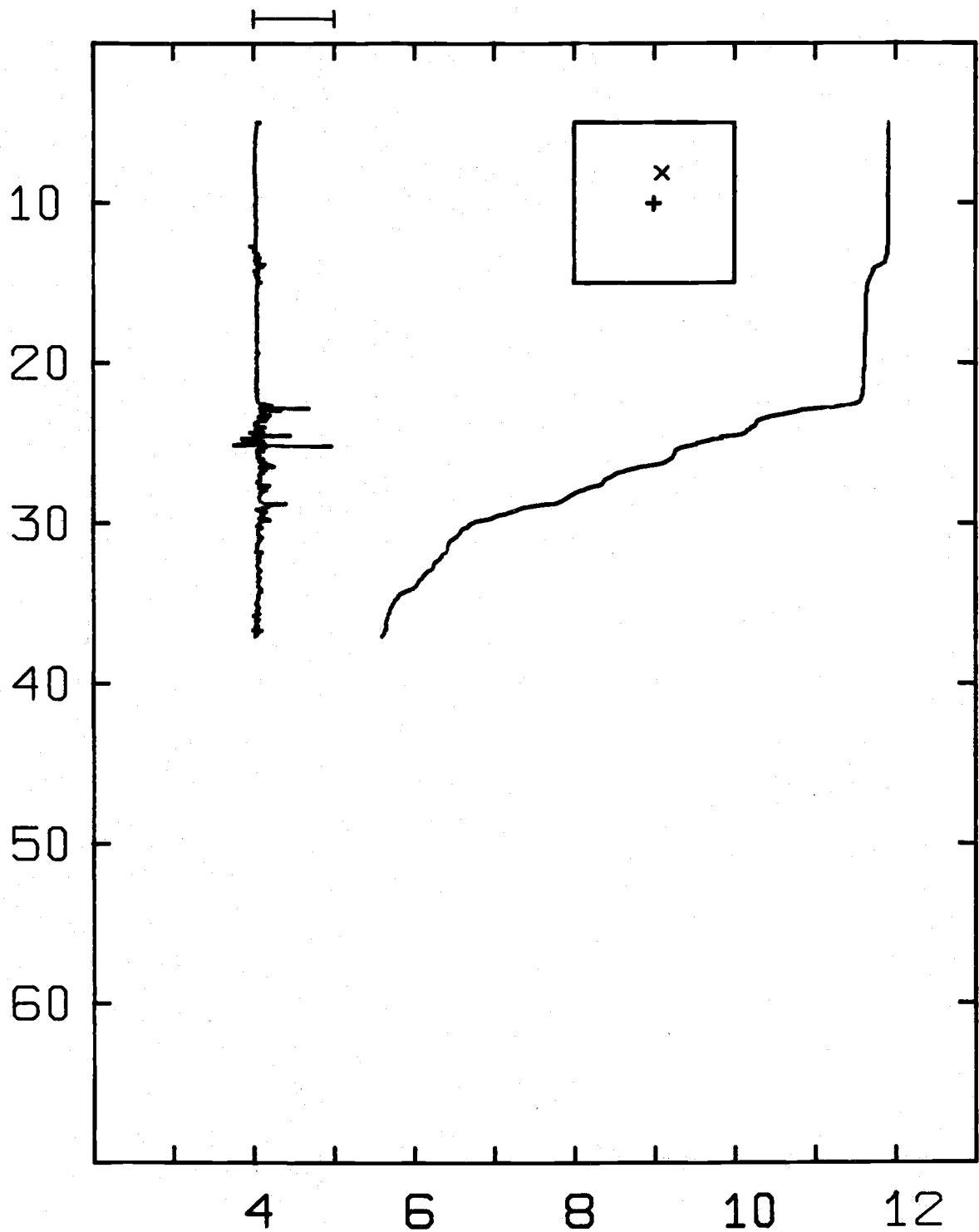
DATE 8/27/77

RANGE 1.93

TIME 0745

BEARING 193

10.0 DEG/M UNIT A P826B4



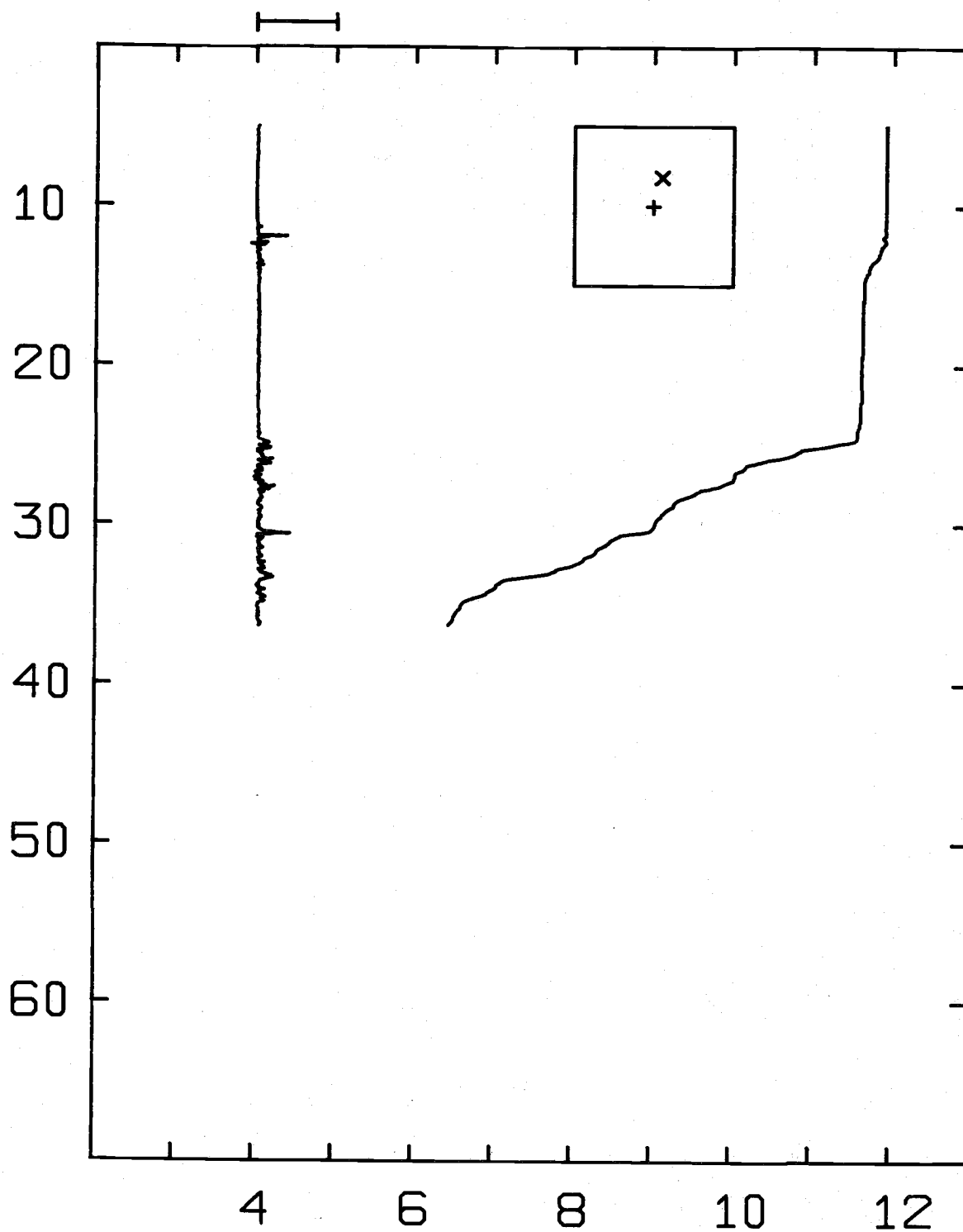
DATE 8/27/77

RANGE 1.91

TIME 0751

BEARING 194

10.0 DEG/M UNIT A P826B5



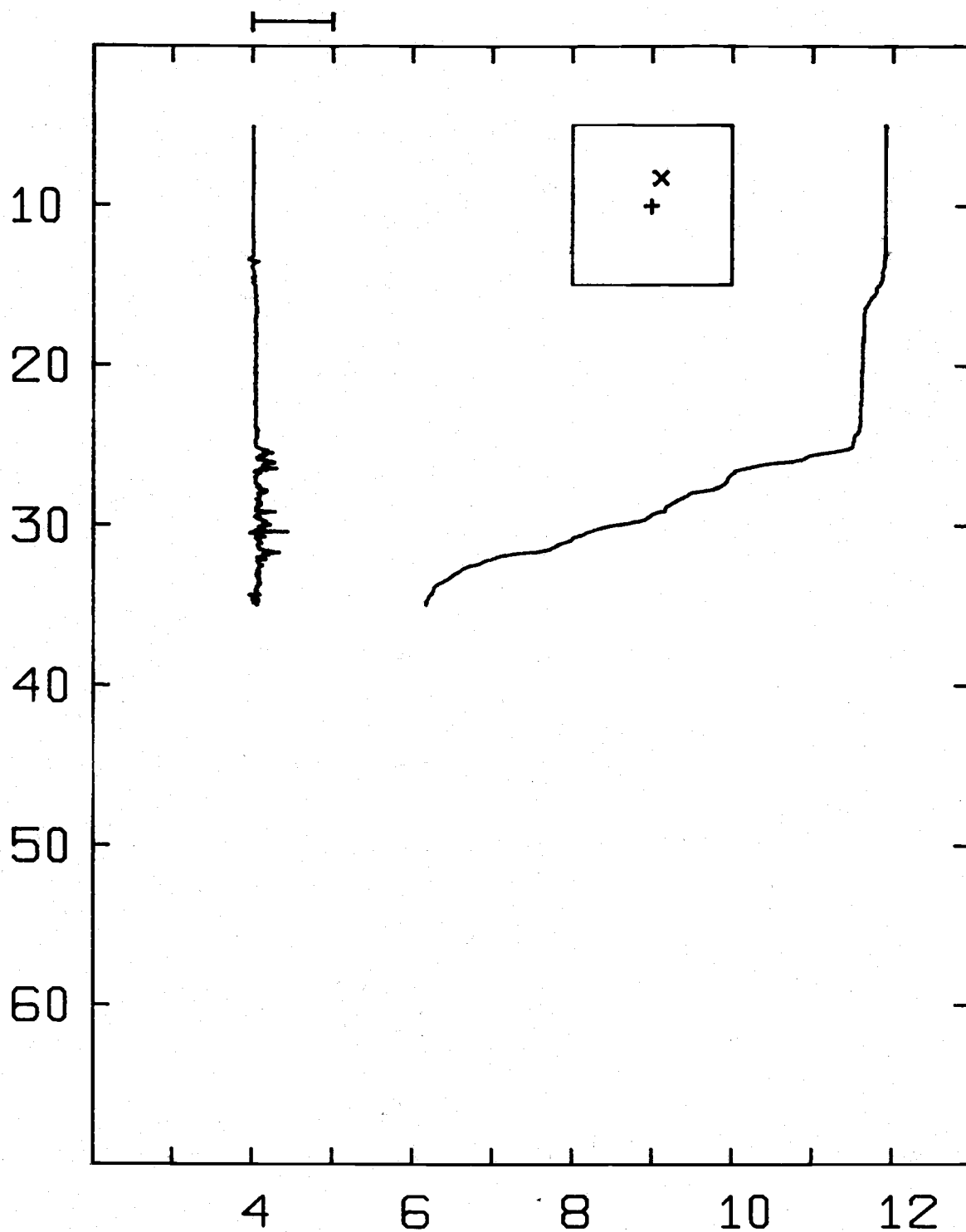
DATE 8/27/77

RANGE 1.89

TIME 0758

BEARING 196

10.0 DEG/M UNIT A P826B6



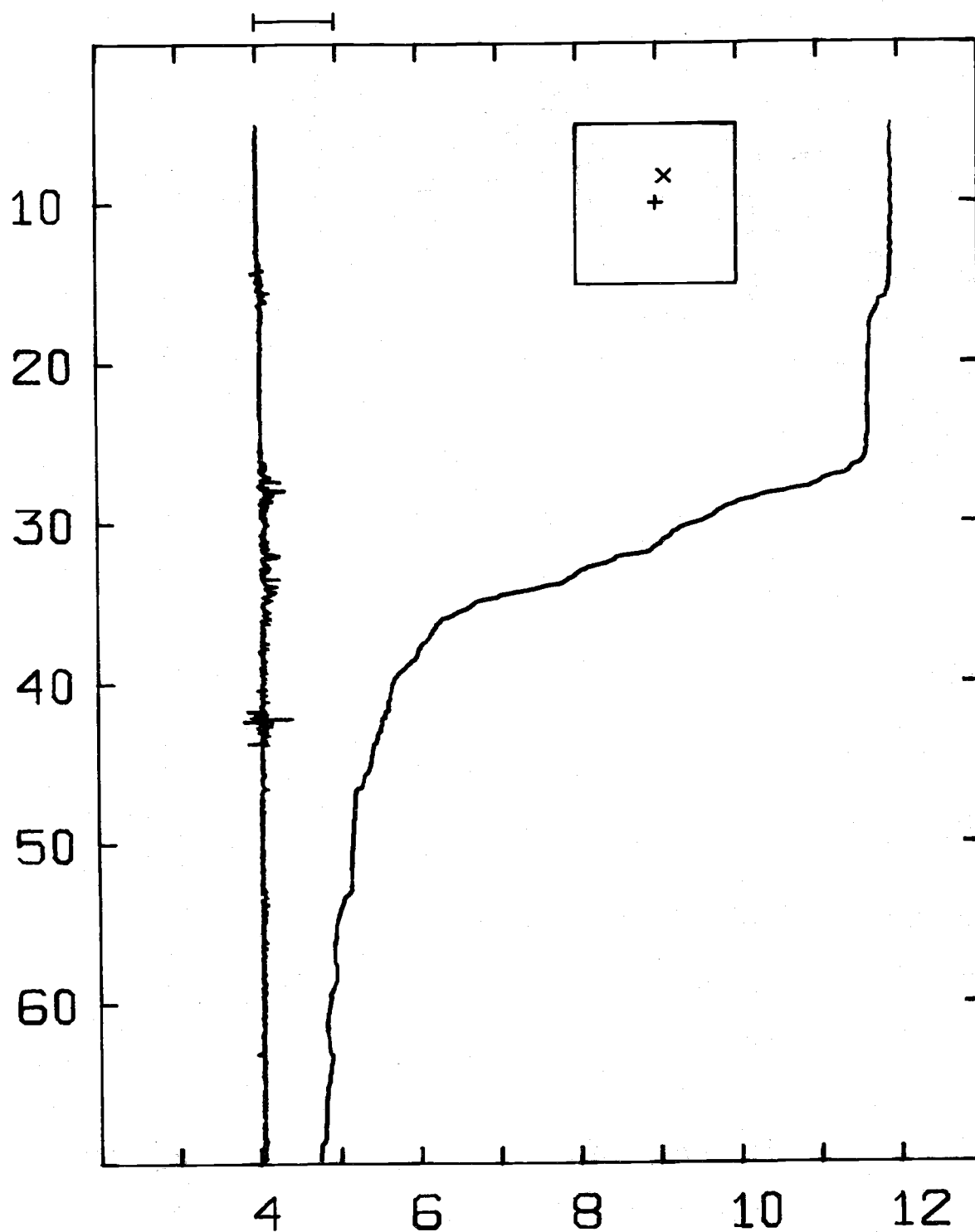
DATE 8/27/77

RANGE 1.82

TIME 0804

BEARING 198

10.0 DEG/M UNIT A P826B7



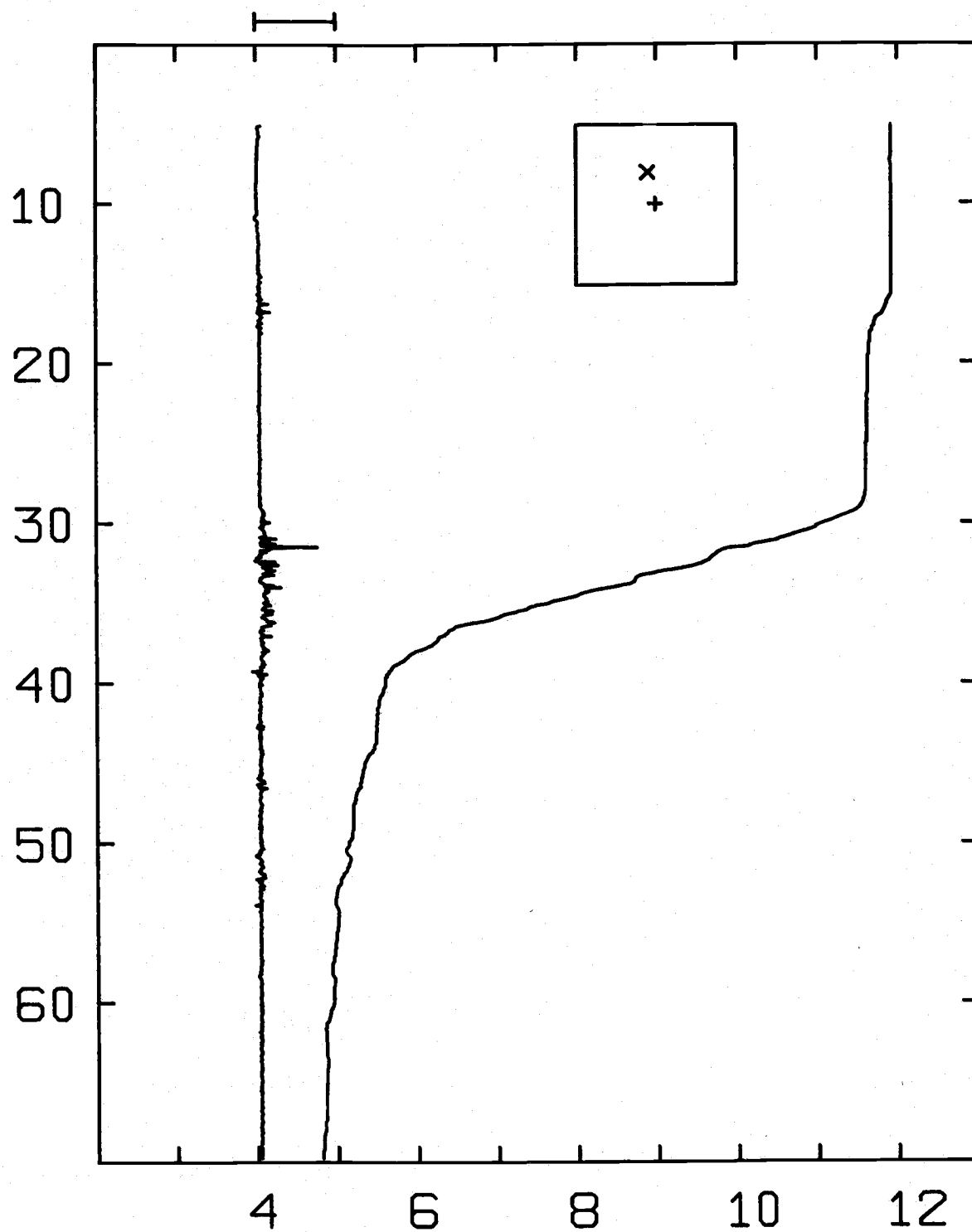
DATE 8/27/77

RANGE 1.78

TIME 0810

BEARING 197

10.0 DEG/M UNIT A P826C1



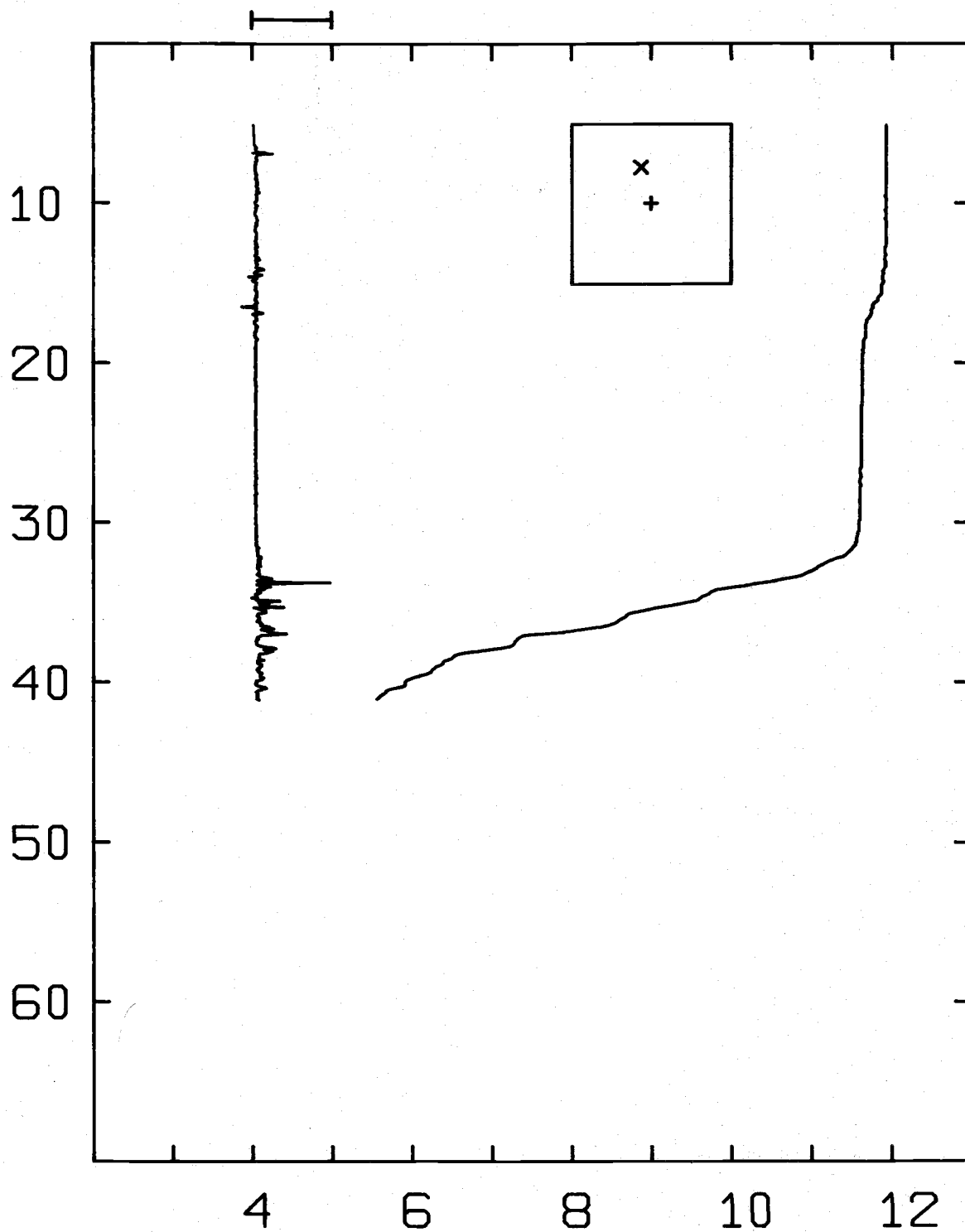
DATE 8/27/77

RANGE 2.04

TIME 0914

BEARING 166

10.0 DEG/M UNIT A P826C2



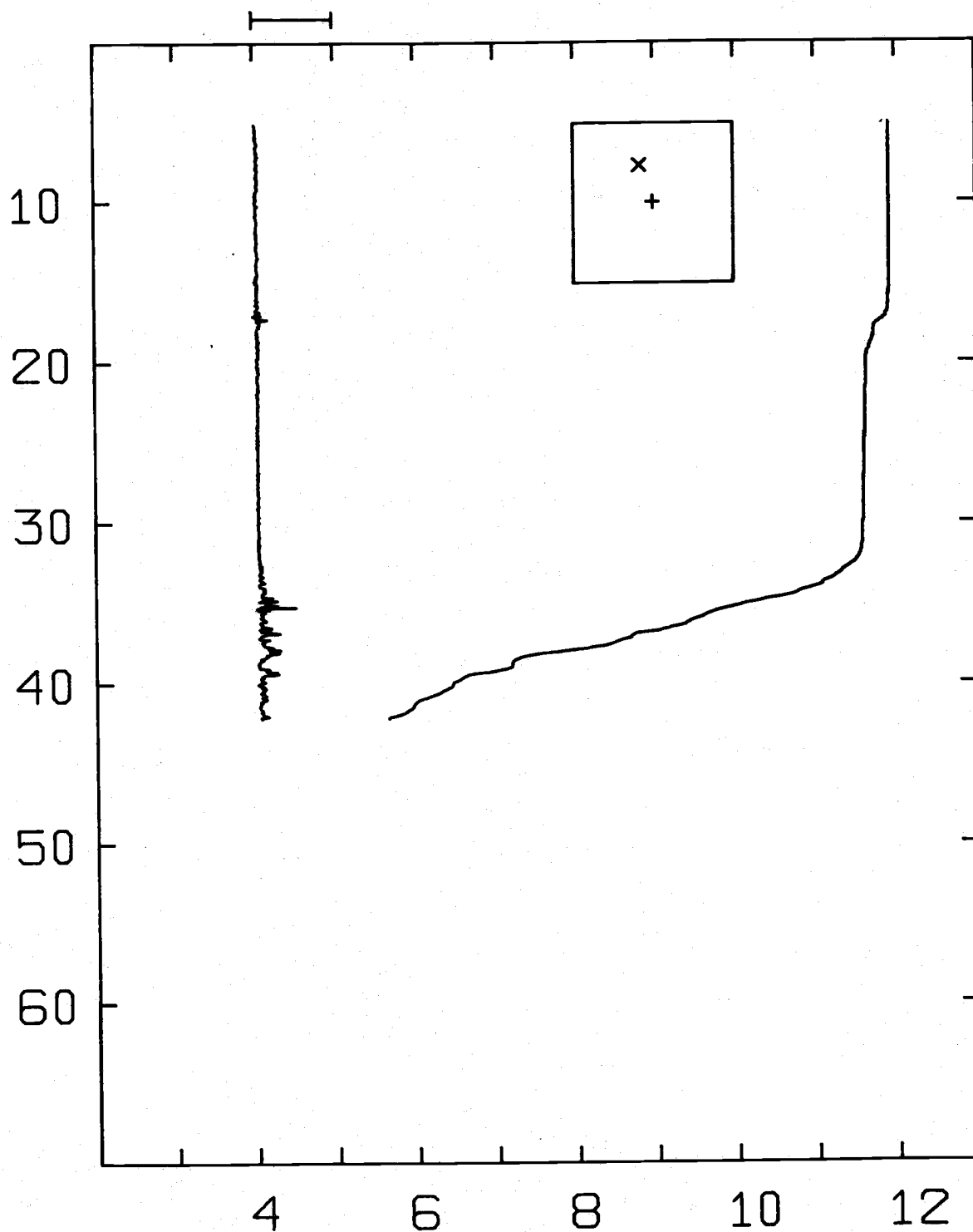
DATE 8/27/77

RANGE 2.34

TIME 0942

BEARING 164

10.0 DEG/M UNIT A P826C3



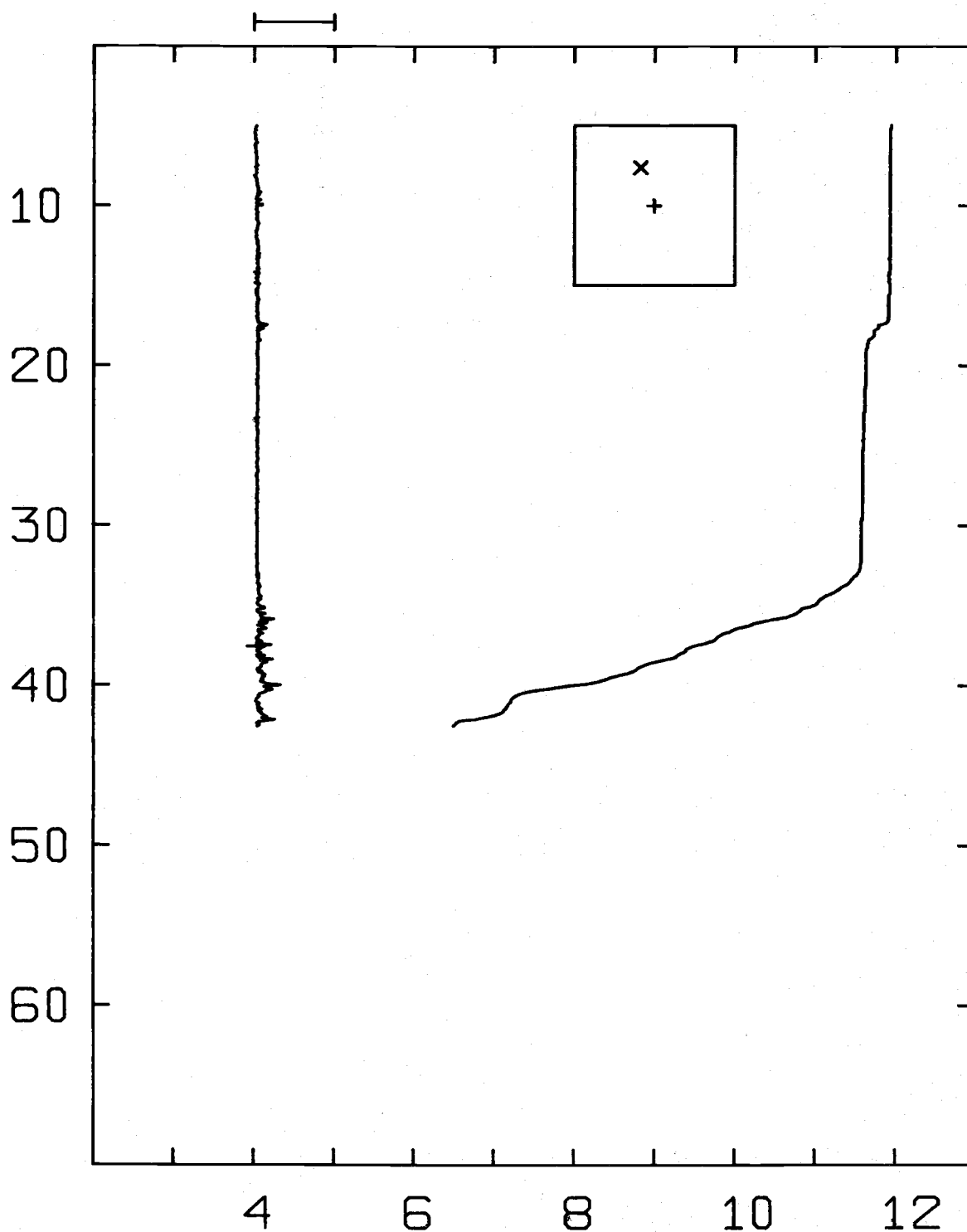
DATE 8/27/77

RANGE 2.45

TIME 0950

BEARING 160

10.0 DEG/M UNIT A P826C4



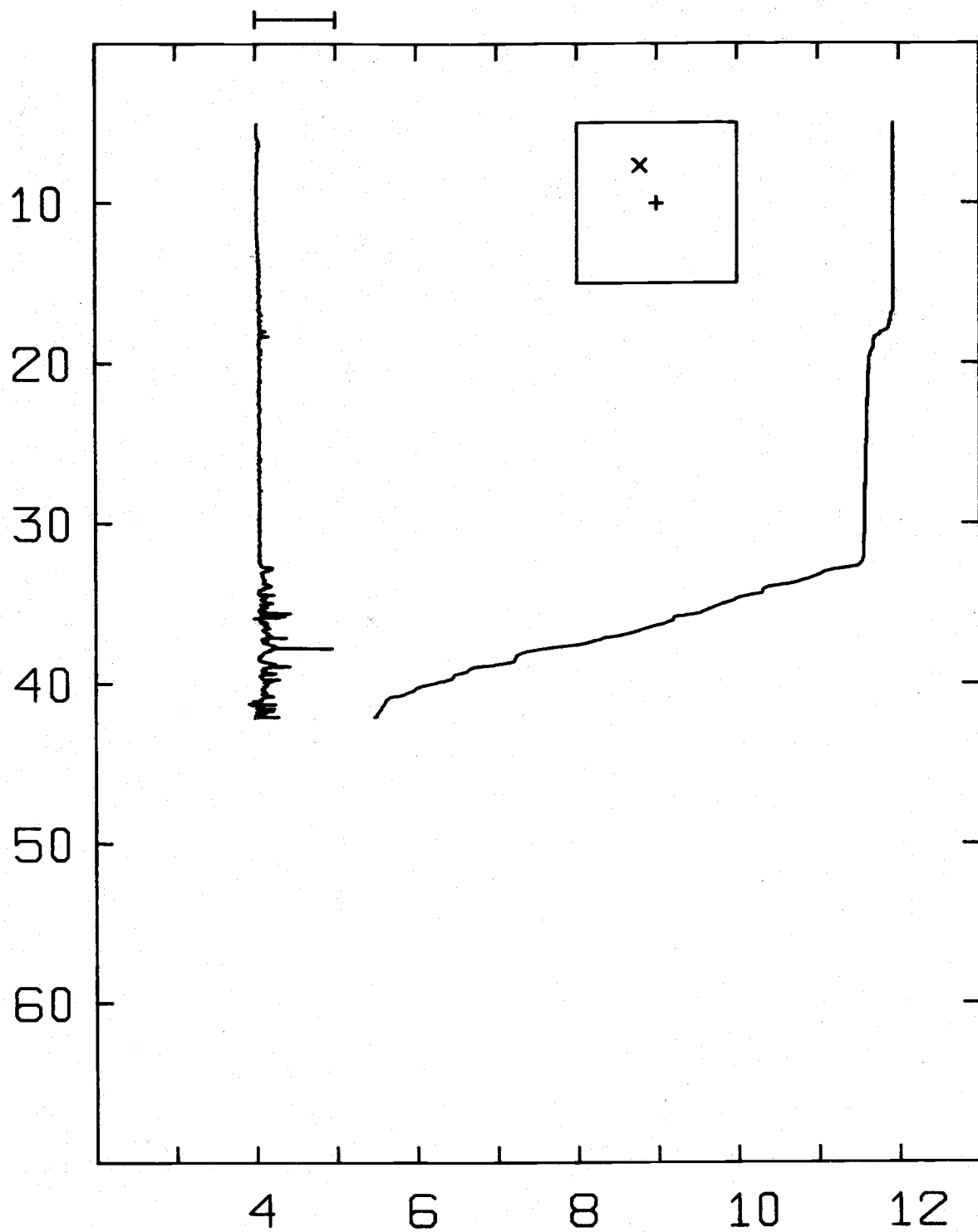
DATE 8/27/77

RANGE 2.52

TIME 1001

BEARING 160

10.0 DEG/M UNIT A P826C5



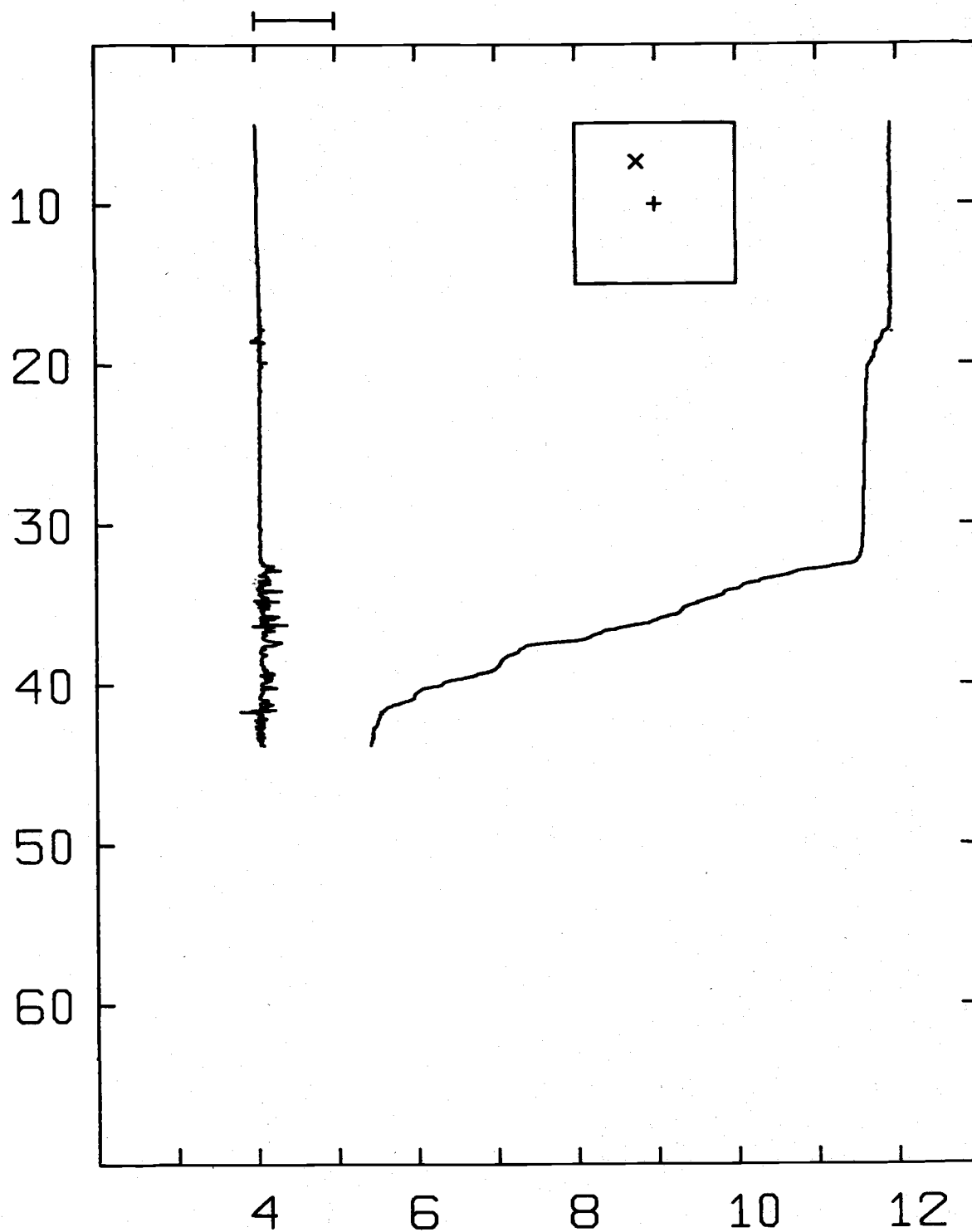
DATE 8/27/77

RANGE 2.56

TIME 1010

BEARING 156

10.0 DEG/M UNIT A P826C6



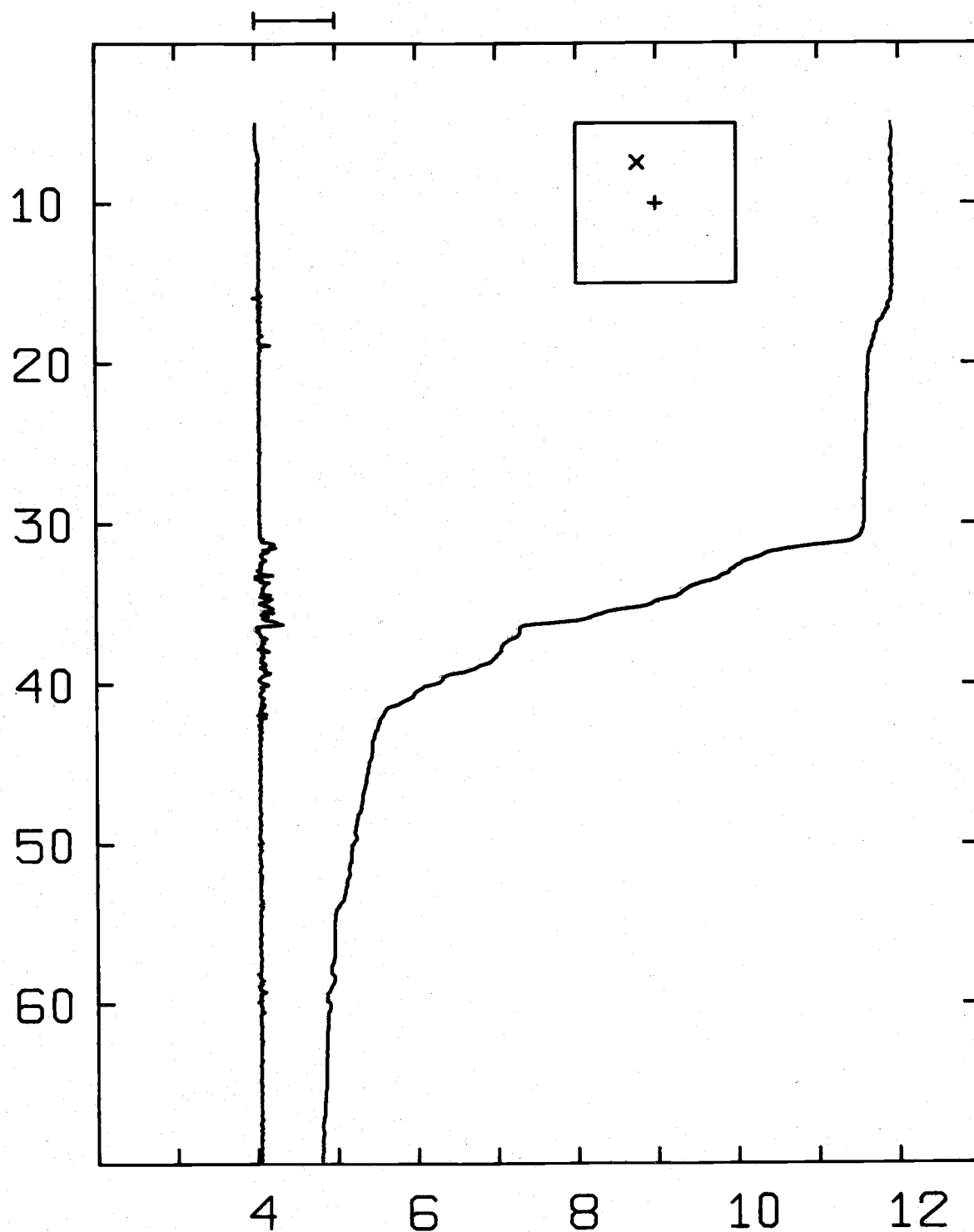
DATE 8/27/77

RANGE 2.84

TIME 1020

BEARING 156

10.0 DEG/M UNIT A P826D1



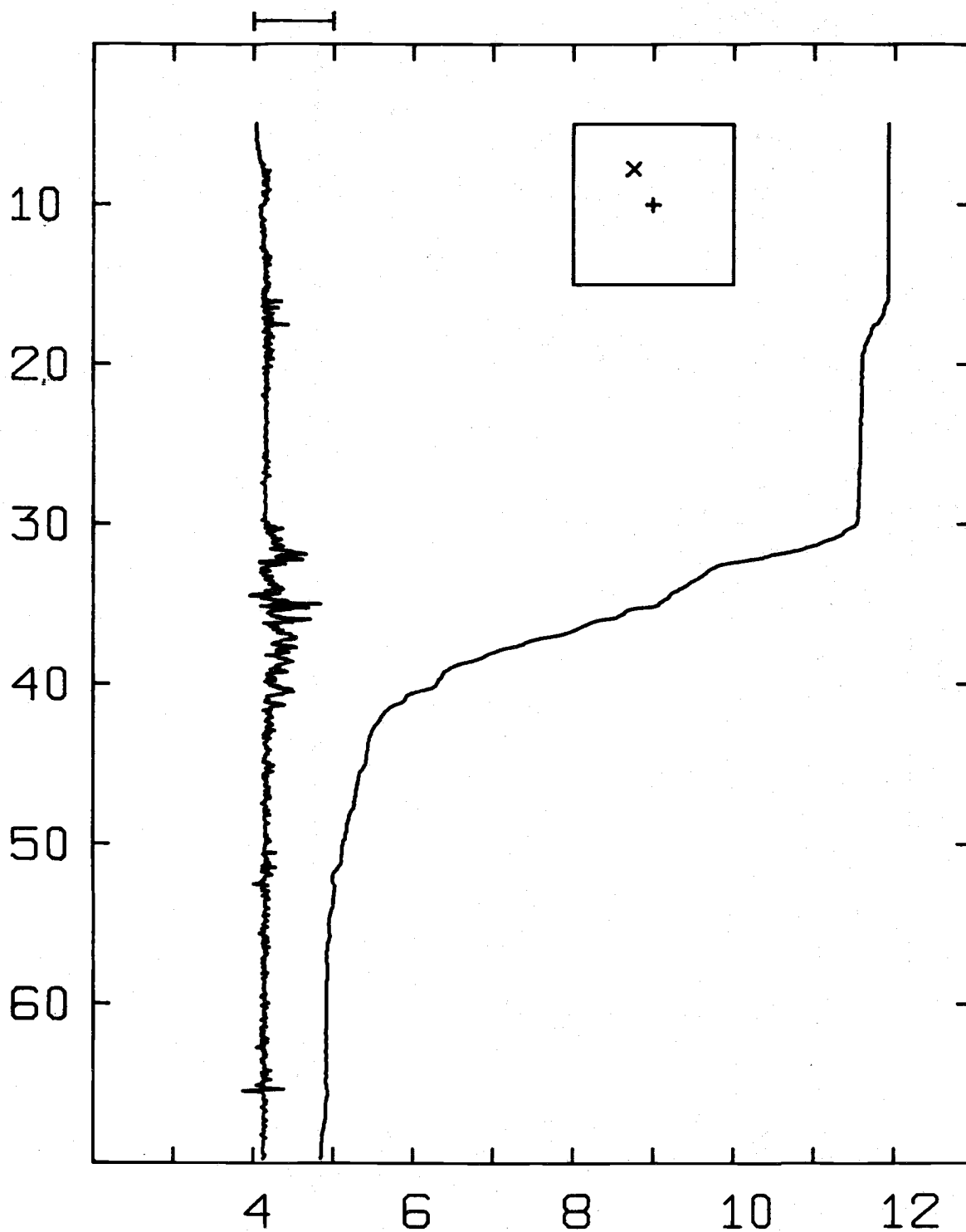
DATE 8/27/77

RANGE 2.82

TIME 1030

BEARING 156

3.00 DEG/M UNIT A P826D2



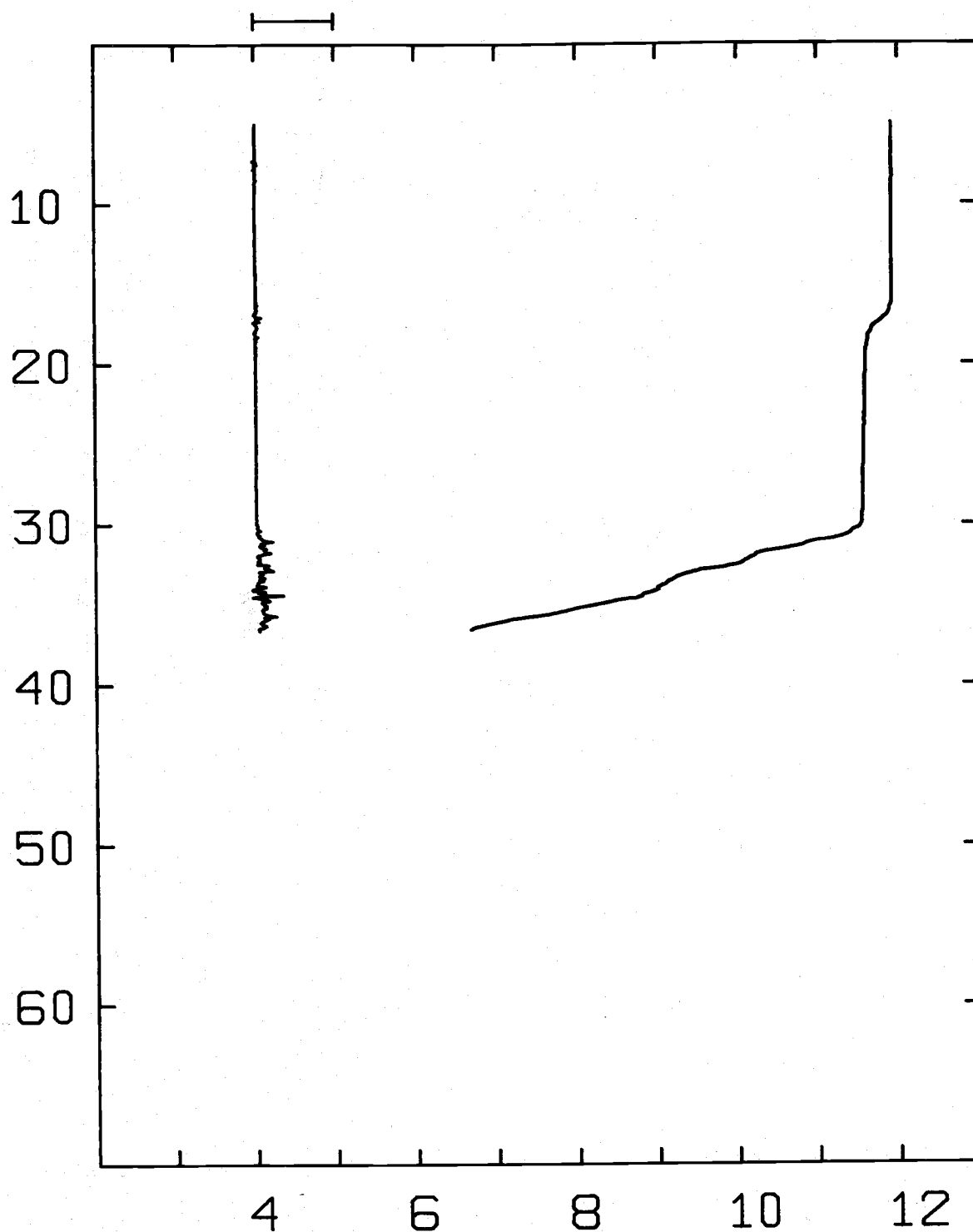
DATE 8/27/77

RANGE 2.54

TIME 1050

BEARING 151

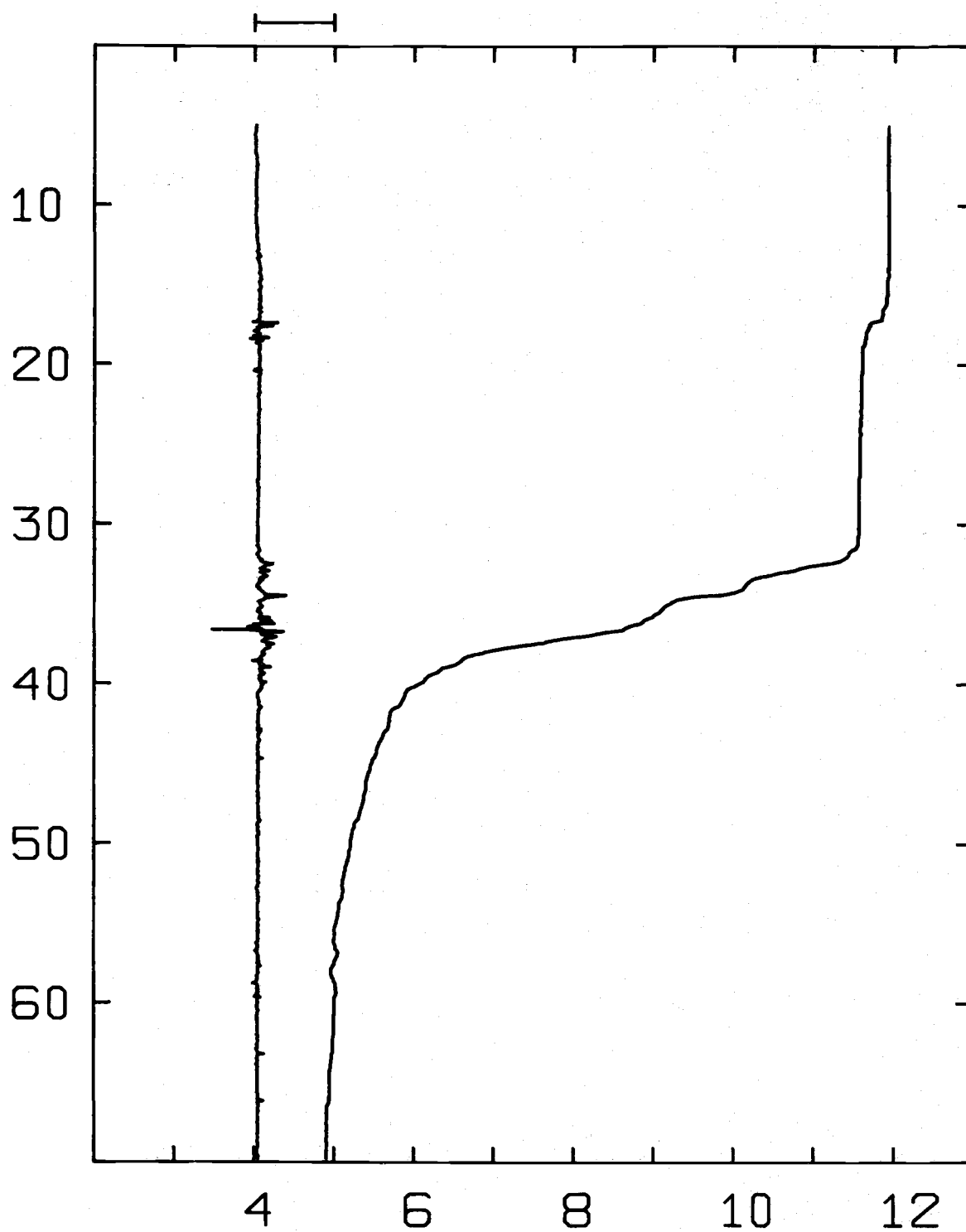
10.0 DEG/M UNIT A P826D3



DATE 8/27/77

TIME 1111

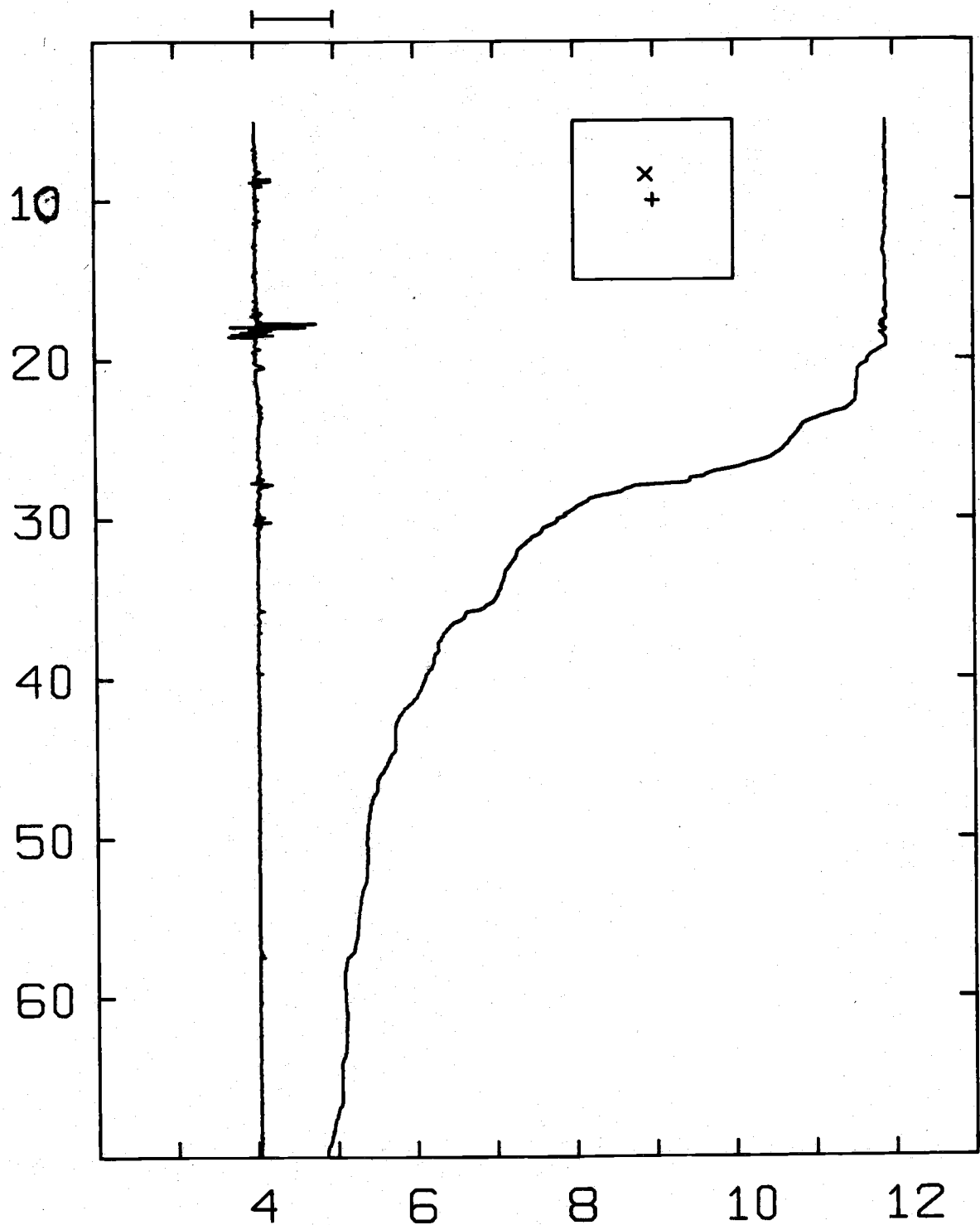
10.0 DEG/M UNIT A P826D4



DATE 8/27/77

TIME 1114

30.0 DEG/M UNIT A P827A2



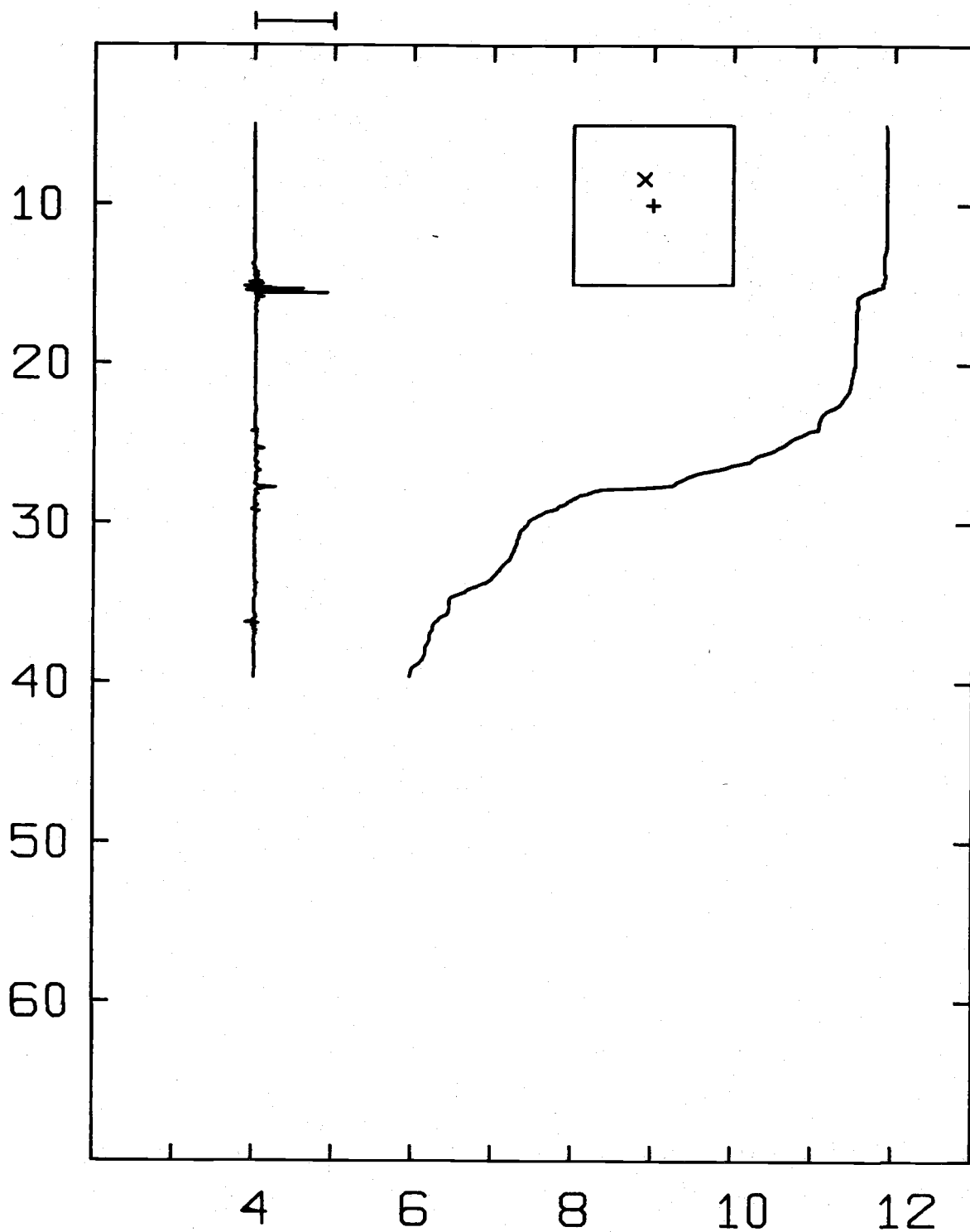
DATE 8/28/77

RANGE 1.70

TIME 0657

BEARING 164

30.0 DEG/M UNIT A P827A3



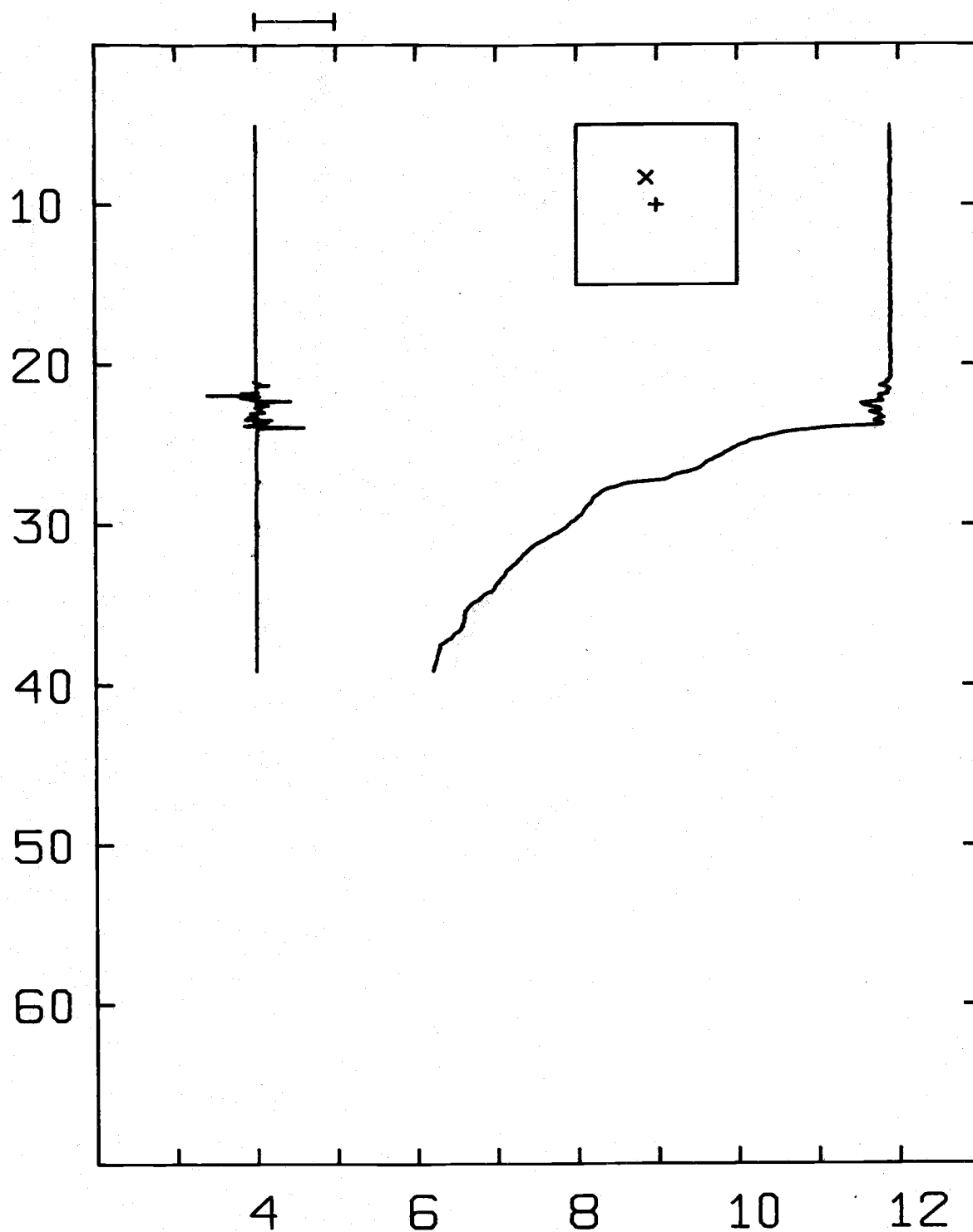
DATE 8/28/77

RANGE 1.74

TIME 0713

BEARING 161

100. DEG/M UNIT A P827A4



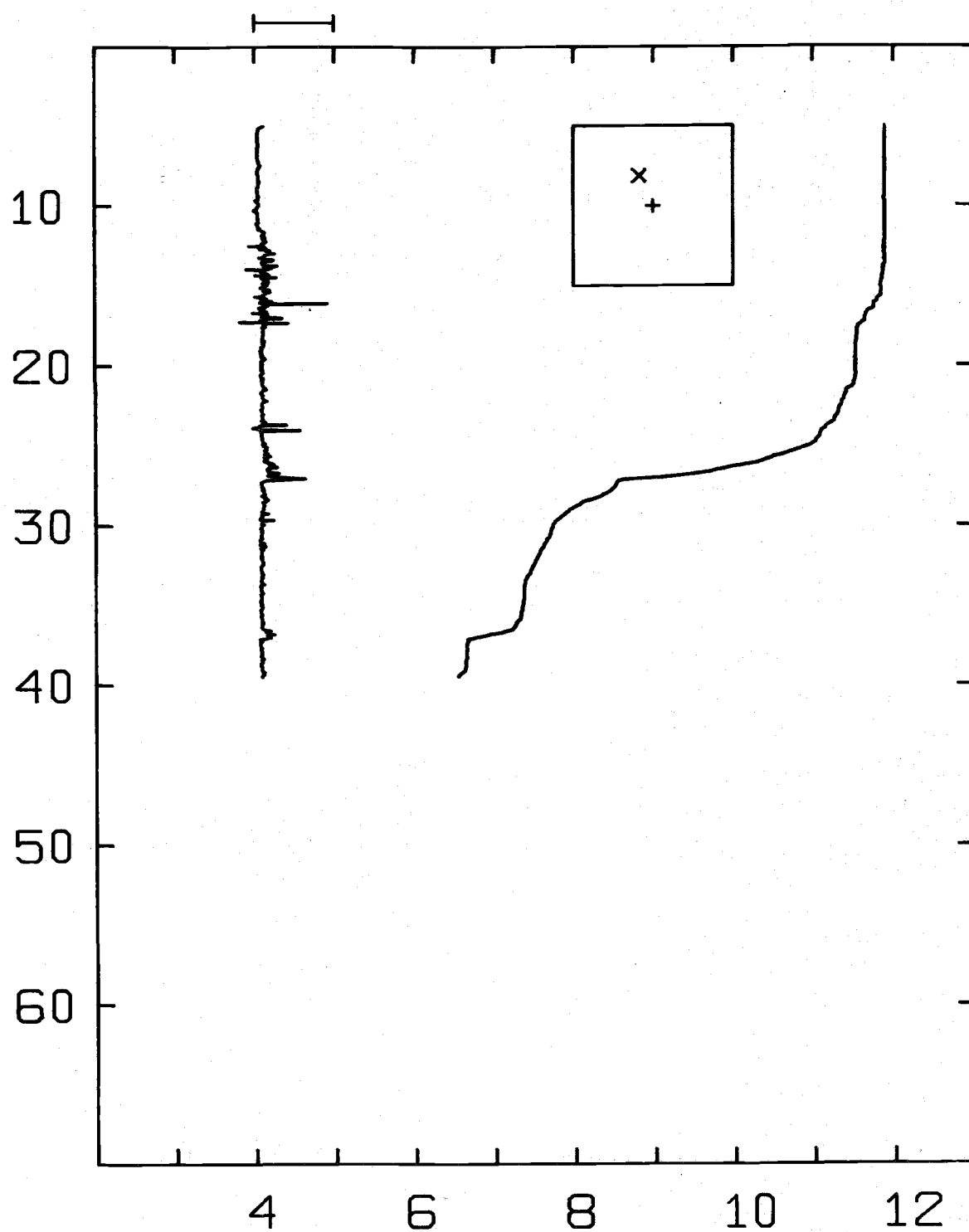
DATE 8/28/77

RANGE 1.83

TIME 0721

BEARING 159

10.0 DEG/M UNIT A P827A6



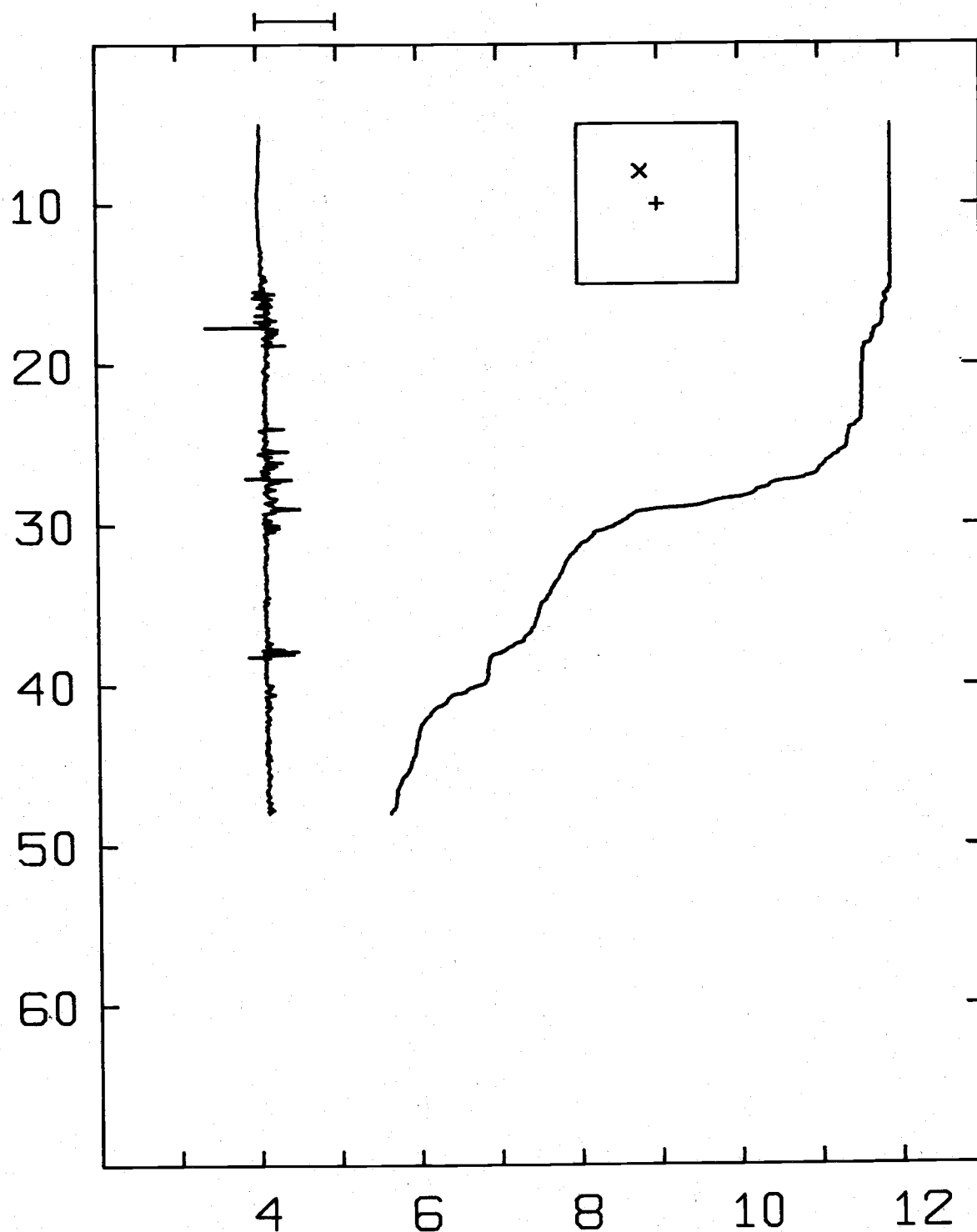
DATE 8/28/77

RANGE 2.11

TIME 0737

BEARING 155

10.0 DEG/M UNIT A P827A7



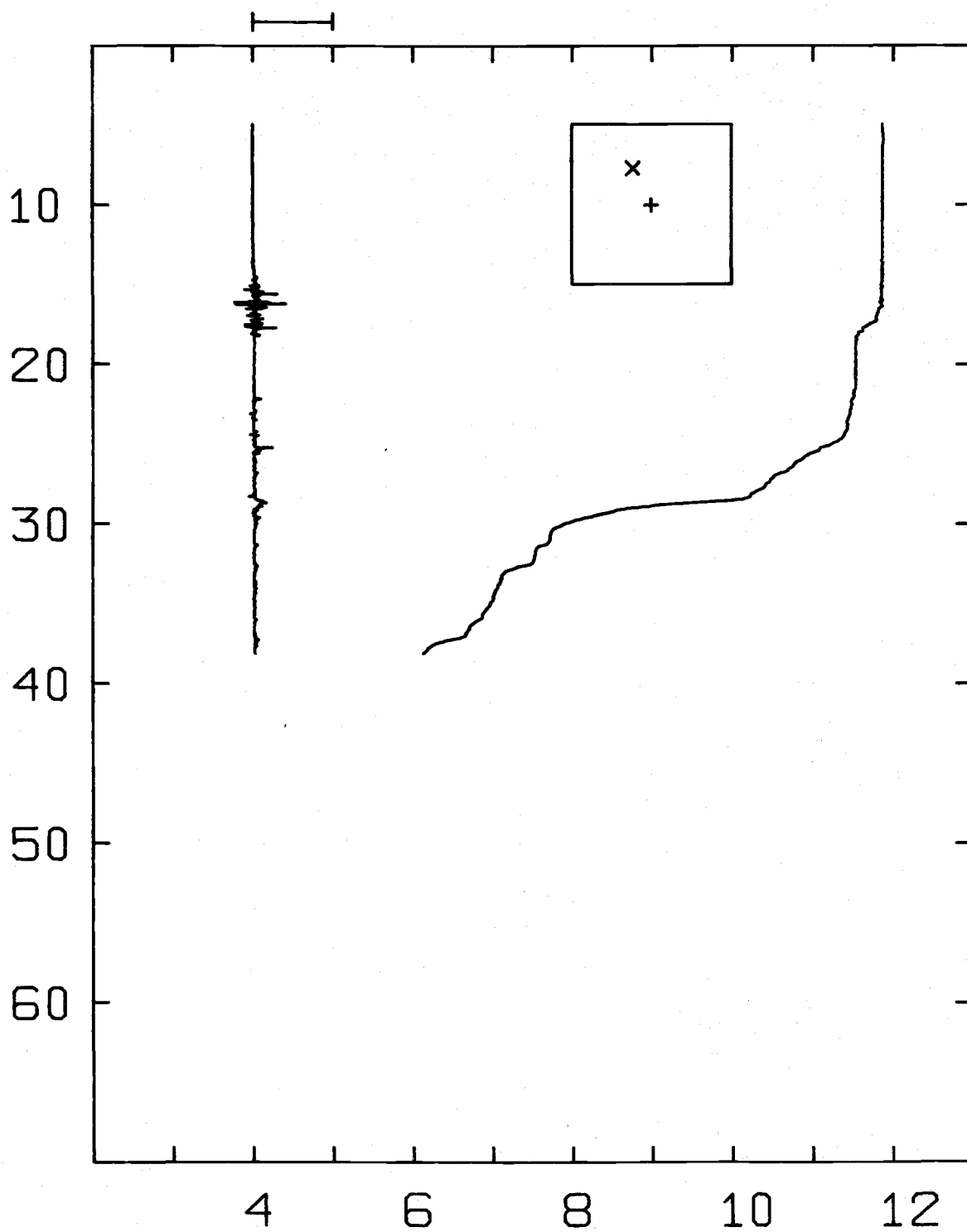
DATE 8/28/77

RANGE 2.30

TIME 0746

BEARING 153

30.0 DEG/M UNIT A P827B3



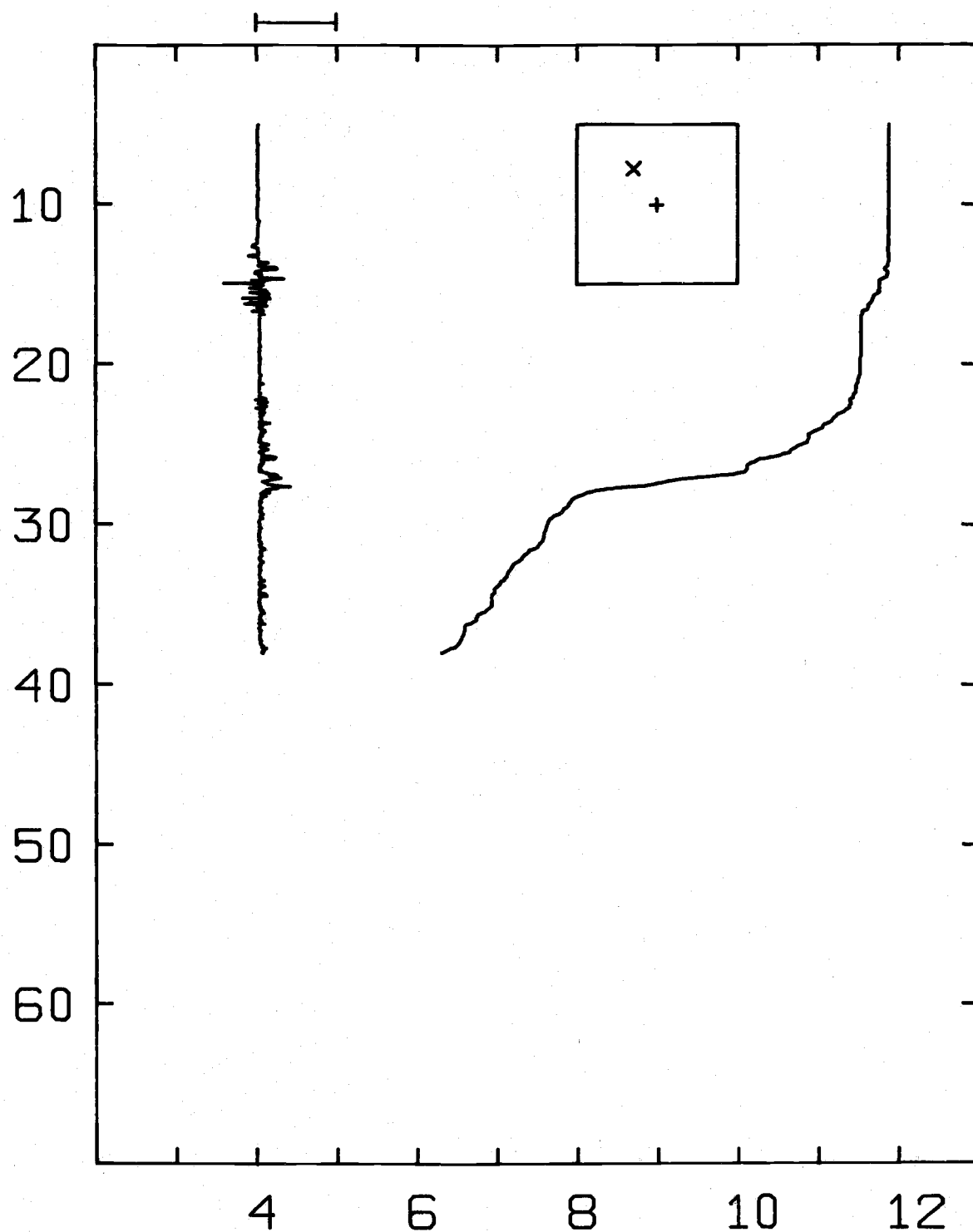
DATE 8/28/77

RANGE 2.59

TIME 0806

BEARING 152

10.0 DEG/M UNIT A P827B4



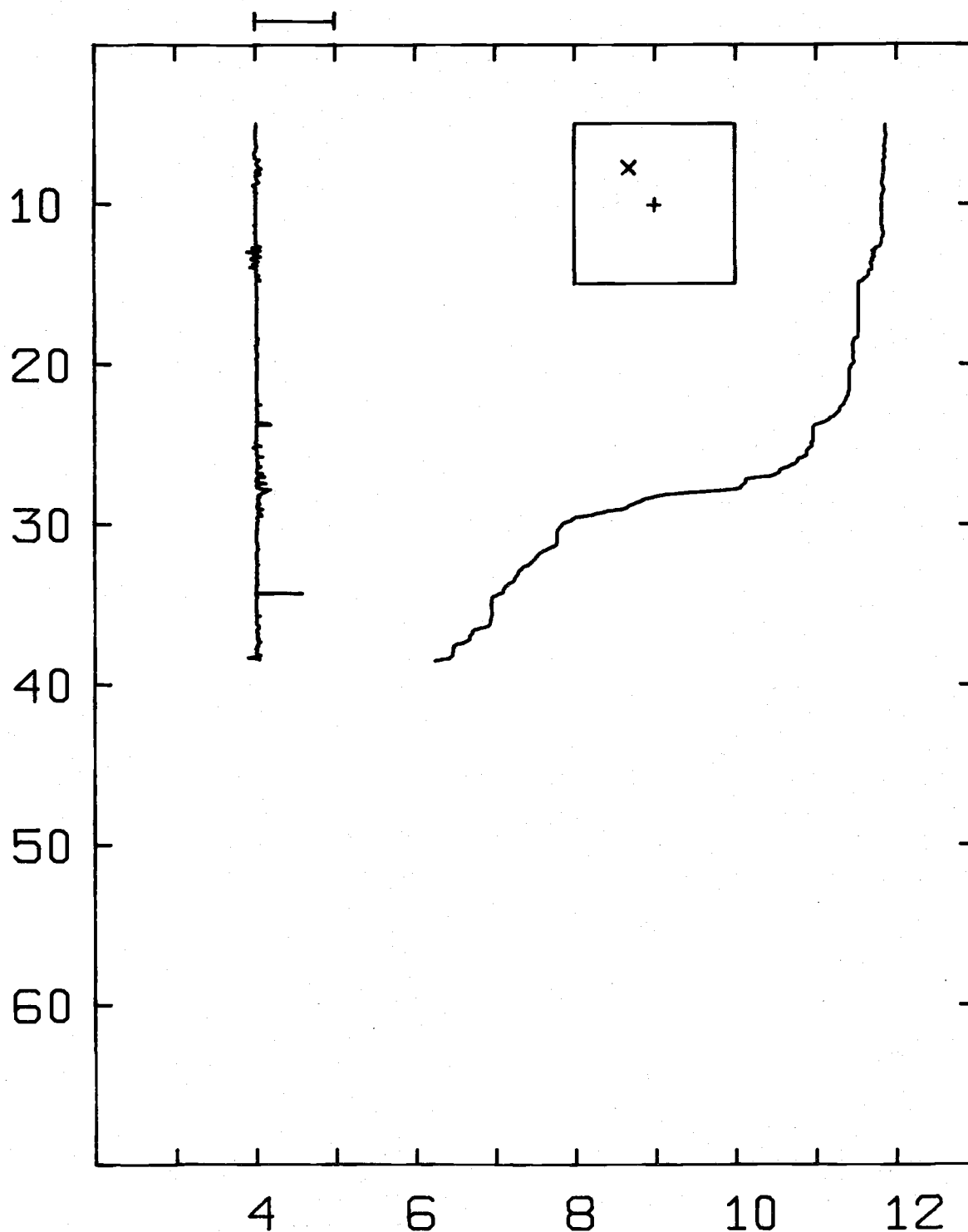
DATE 8/28/77

RANGE 2.74

TIME 0814

BEARING 148

30.0 DEG/M UNIT A P827B5



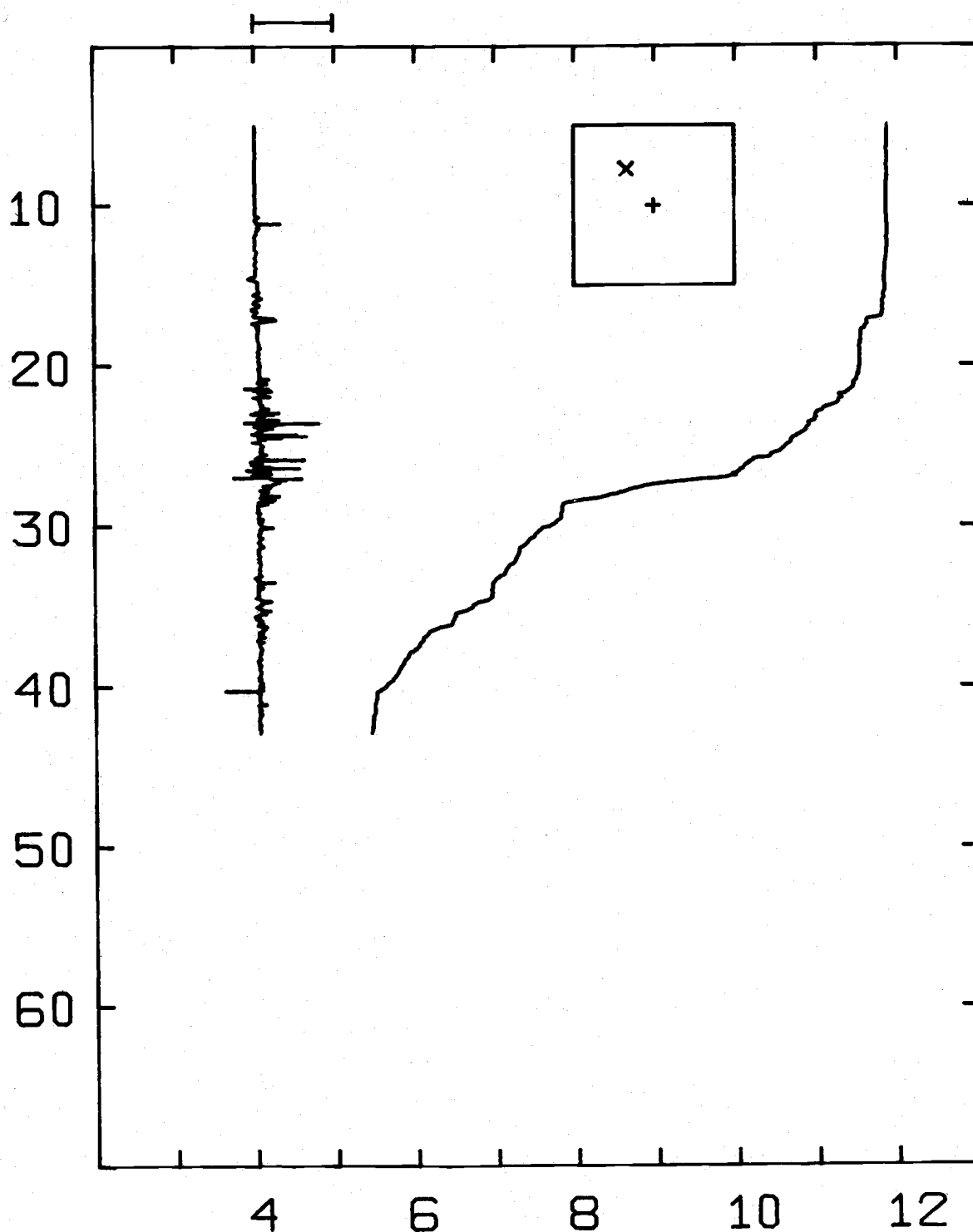
DATE 8/28/77

RANGE 2.82

TIME 0822

BEARING 145

10.0 DEG/M UNIT A P827B6



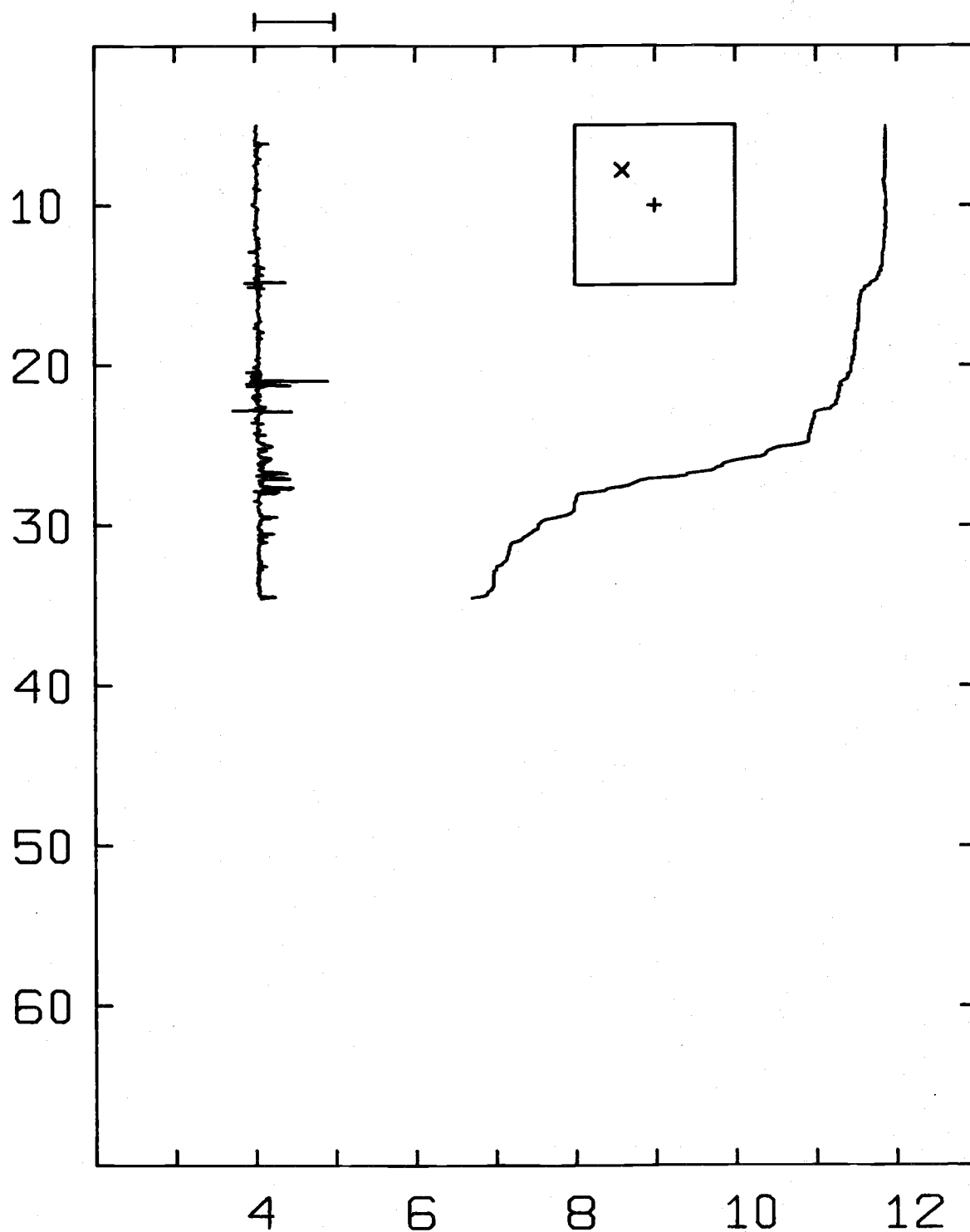
DATE 8/28/77

RANGE 2.82

TIME 0829

BEARING 143

10.0 DEG/M UNIT A P827B7



DATE 8/28/77

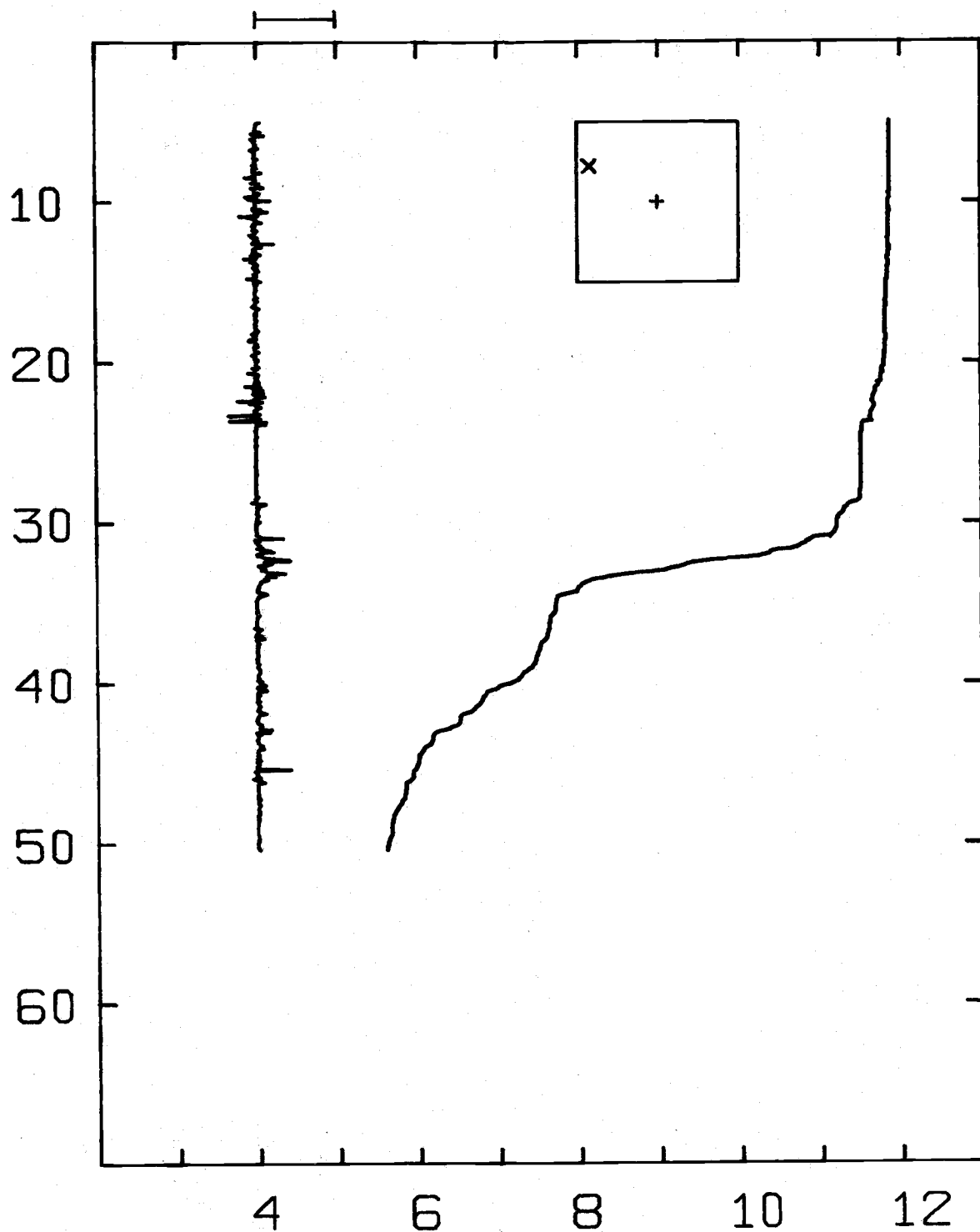
RANGE 3.00

TIME 0838

BEARING 137

10.0 DEG/M UNIT^A

P827C4



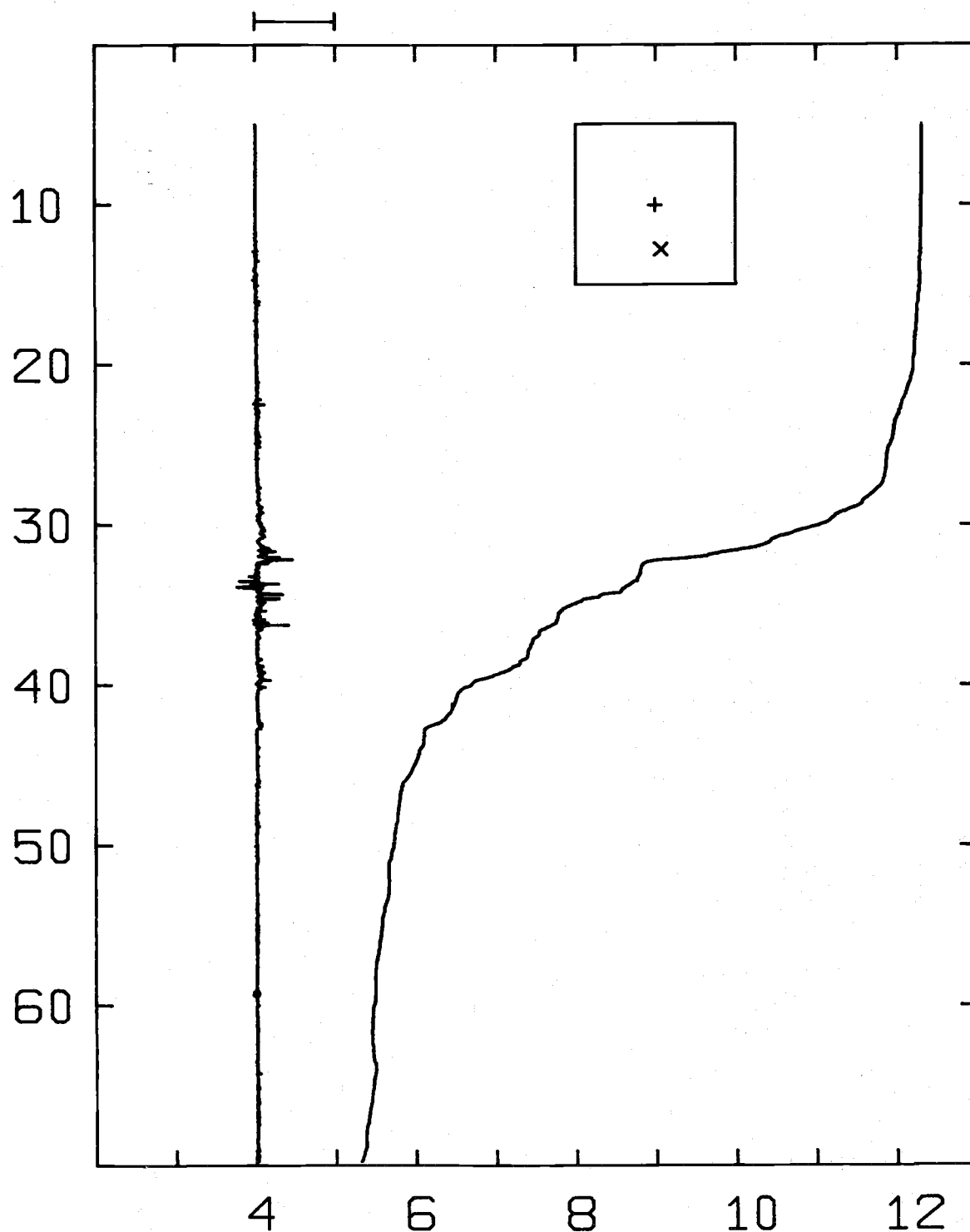
DATE 8/28/77

RANGE 4.78

TIME 1021

BEARING 118

10.0 DEG/M UNIT C P828A1



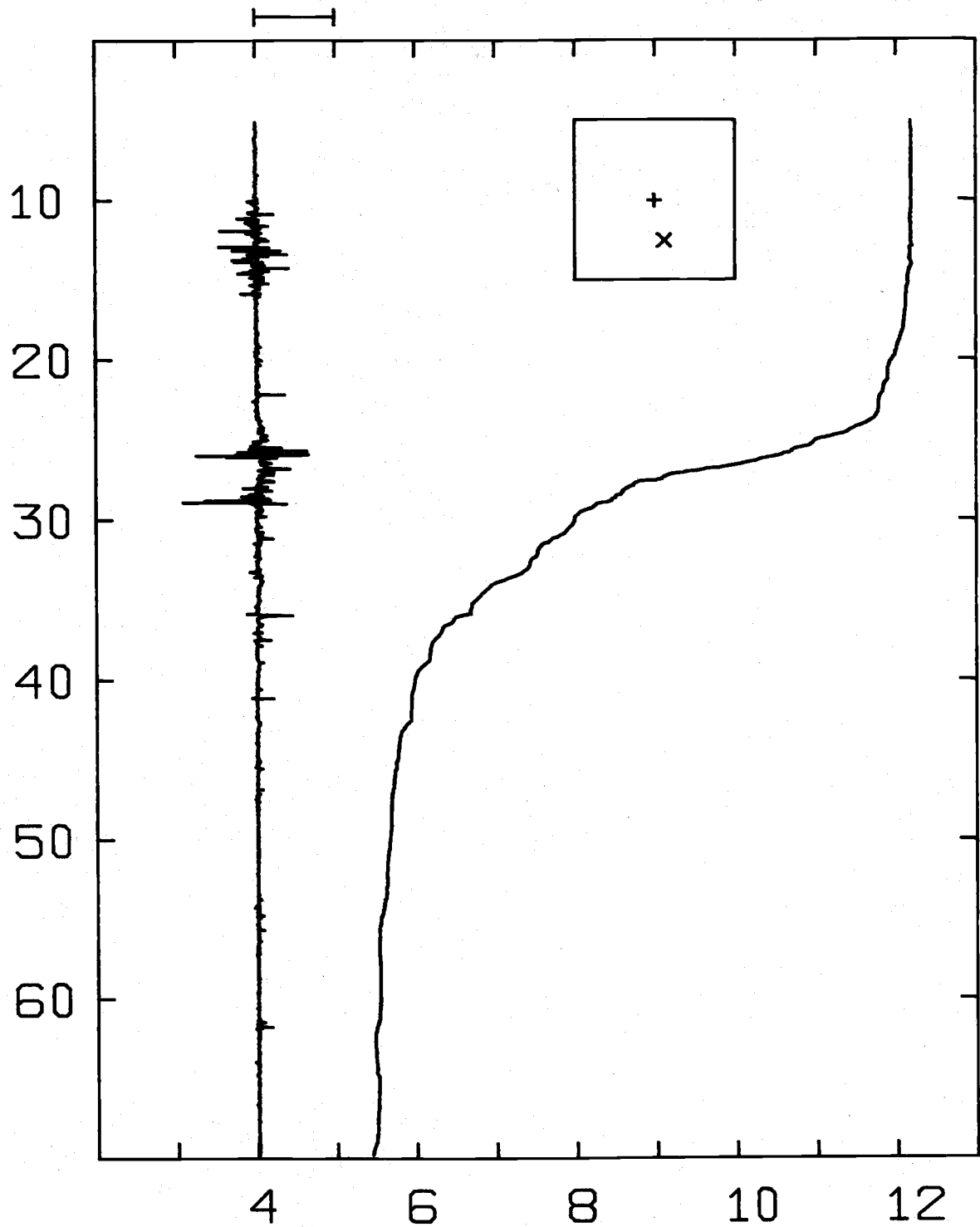
DATE 8/29/77

RANGE 2.84

TIME 0527

BEARING 353

10.0 DEG/M UNIT C P828A2



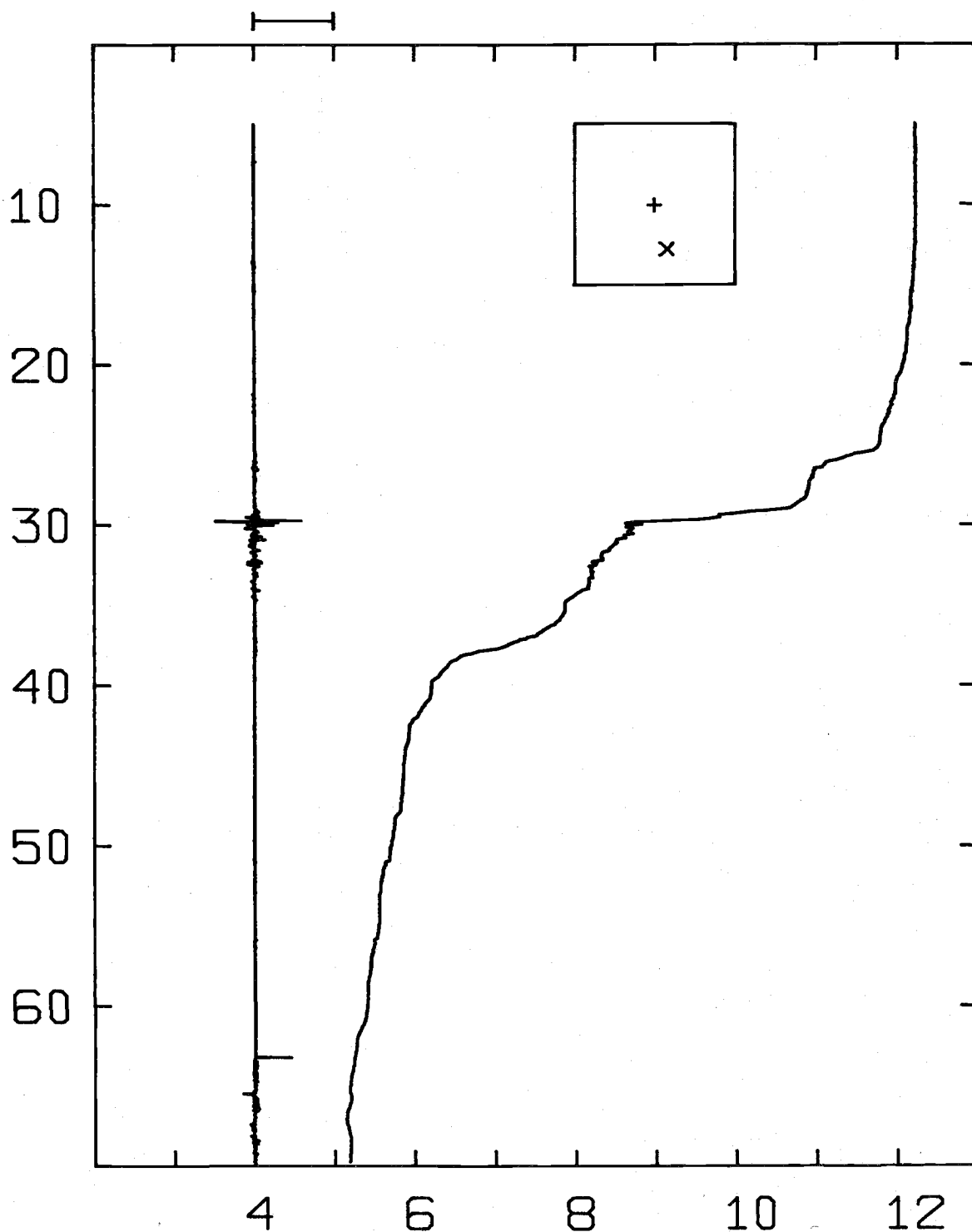
DATE 8/29/77

RANGE 2.63

TIME 0600

BEARING 347

100. DEG/M UNIT C P828B1



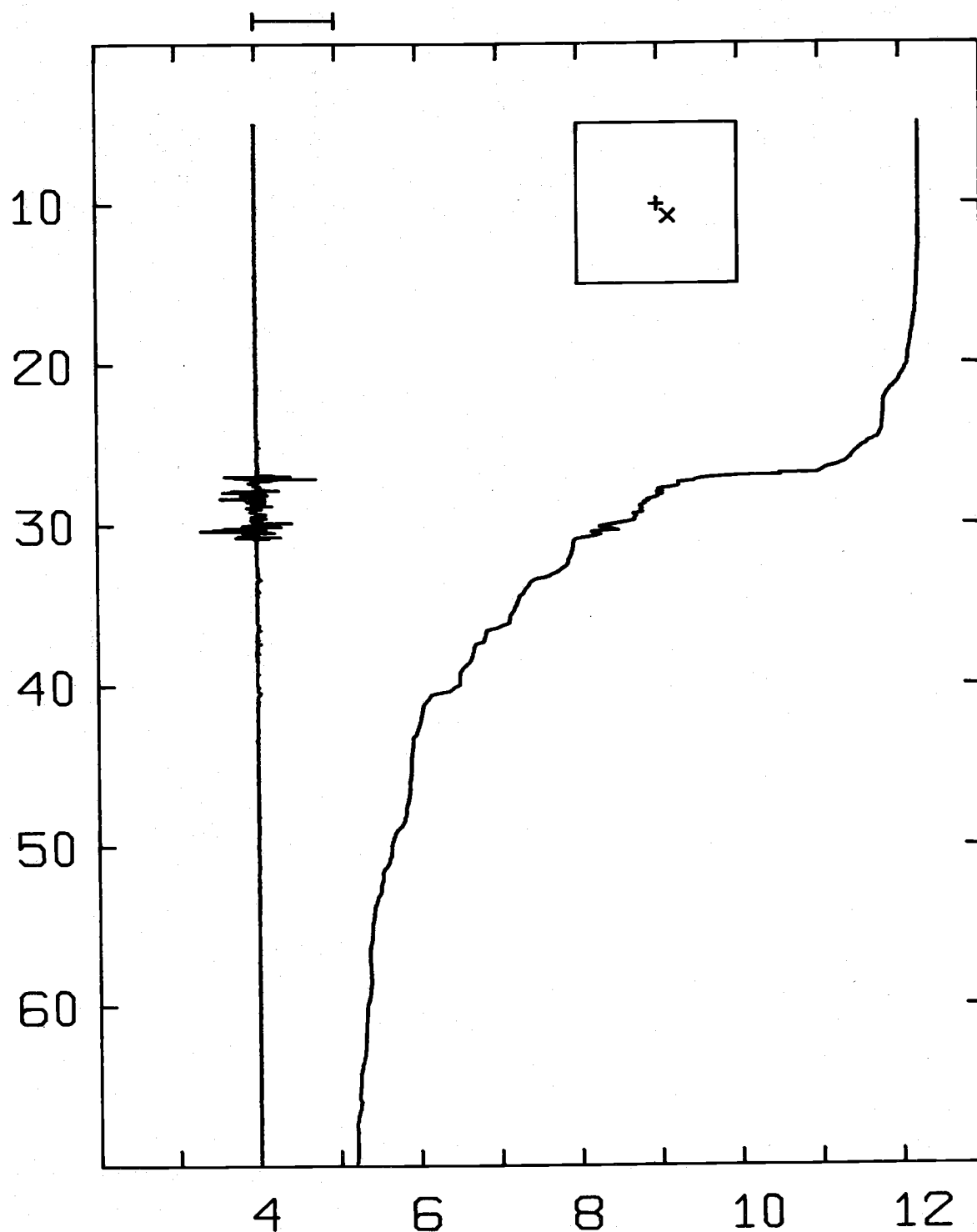
DATE 8/29/77

RANGE 2.91

TIME 0630

BEARING 345

30.0 DEG/M UNIT C P828B2



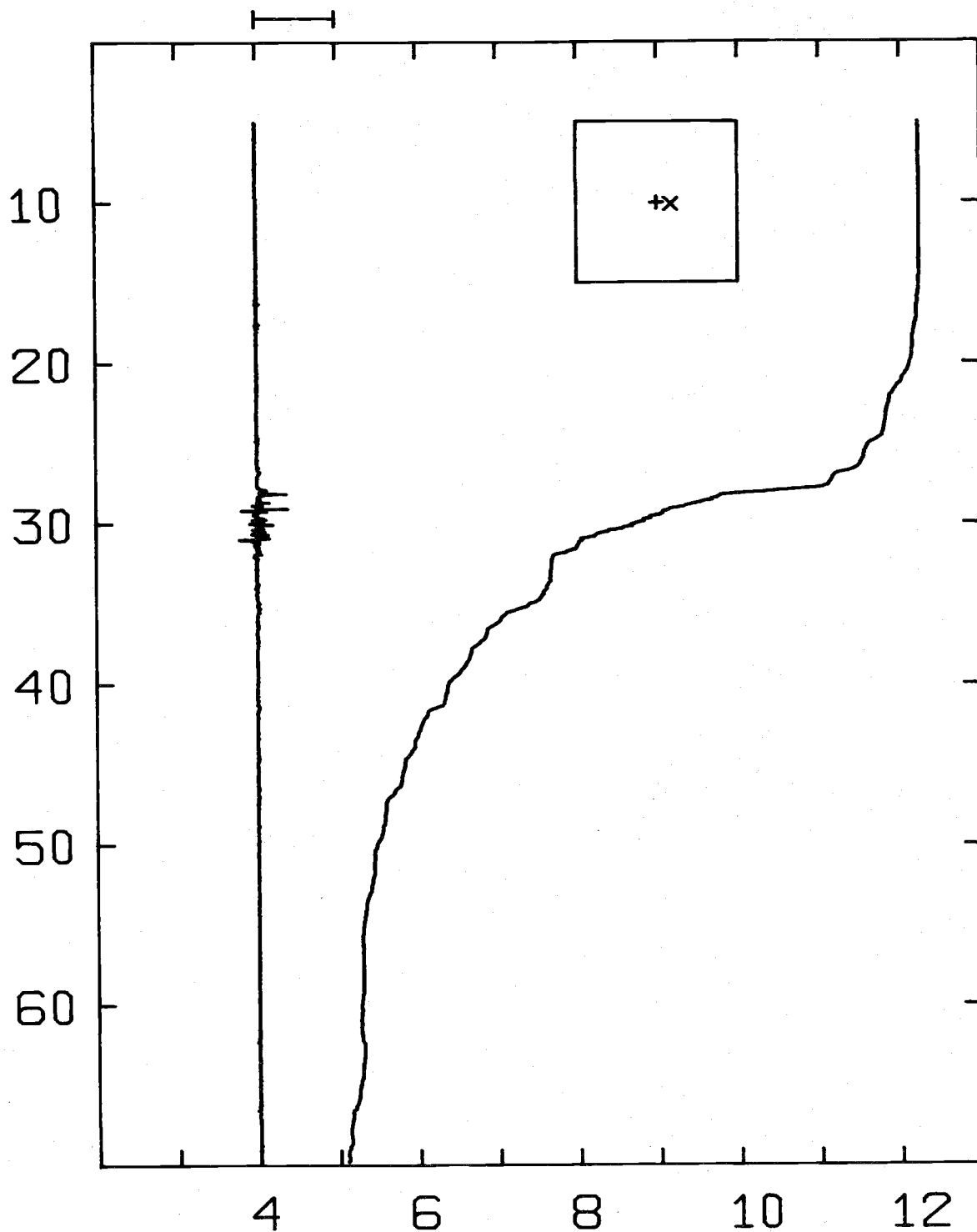
DATE 8/29/77

RANGE 1.06

TIME 0835

BEARING 319

30.0 DEG/M UNIT C P828B3



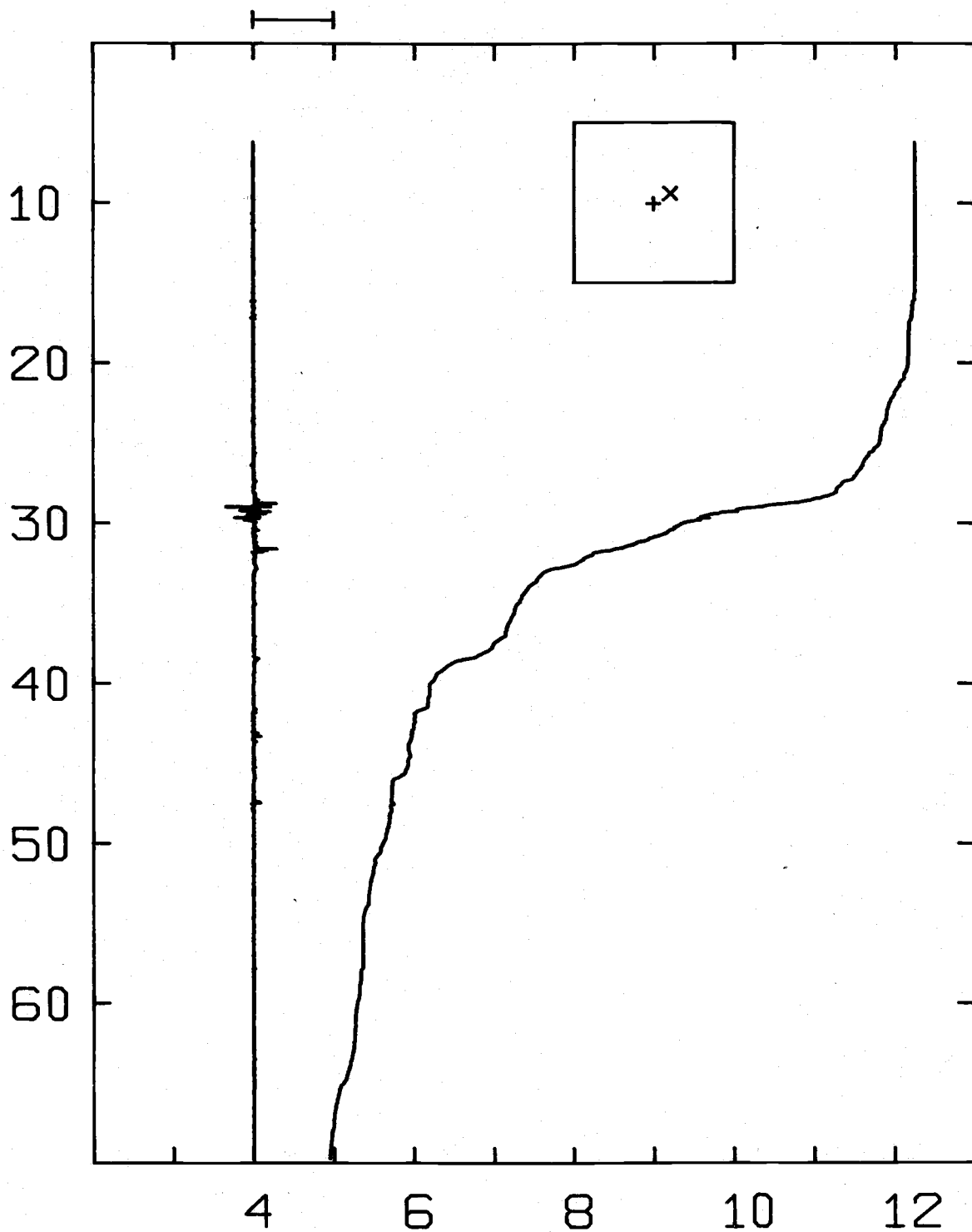
DATE 8/29/77

RANGE .871

TIME 0902

BEARING 277

30.0 DEG/M UNIT C P828C1



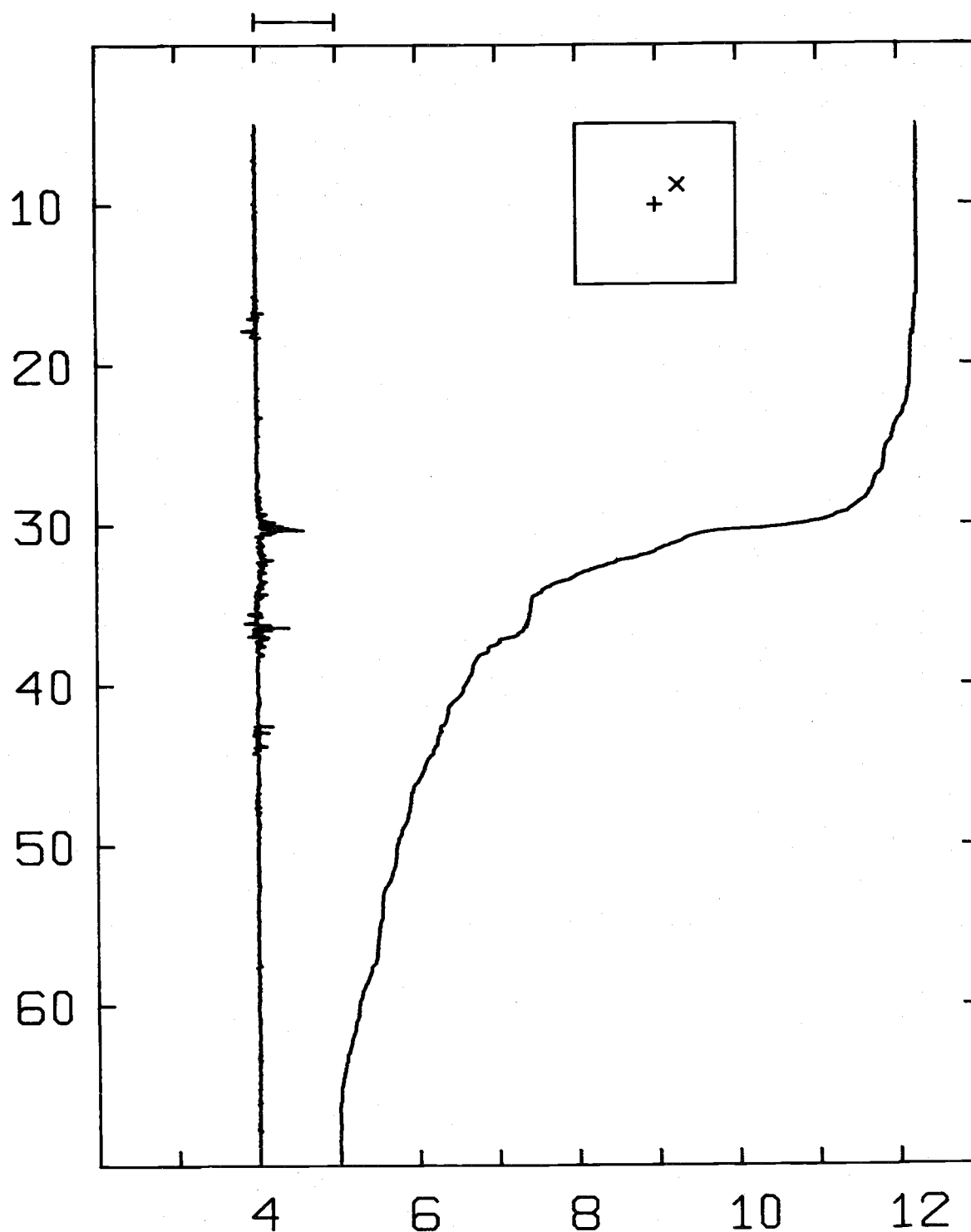
DATE 8/29/77

RANGE 1.20

TIME 0923

BEARING 239

10.0 DEG/M UNIT C P828C2



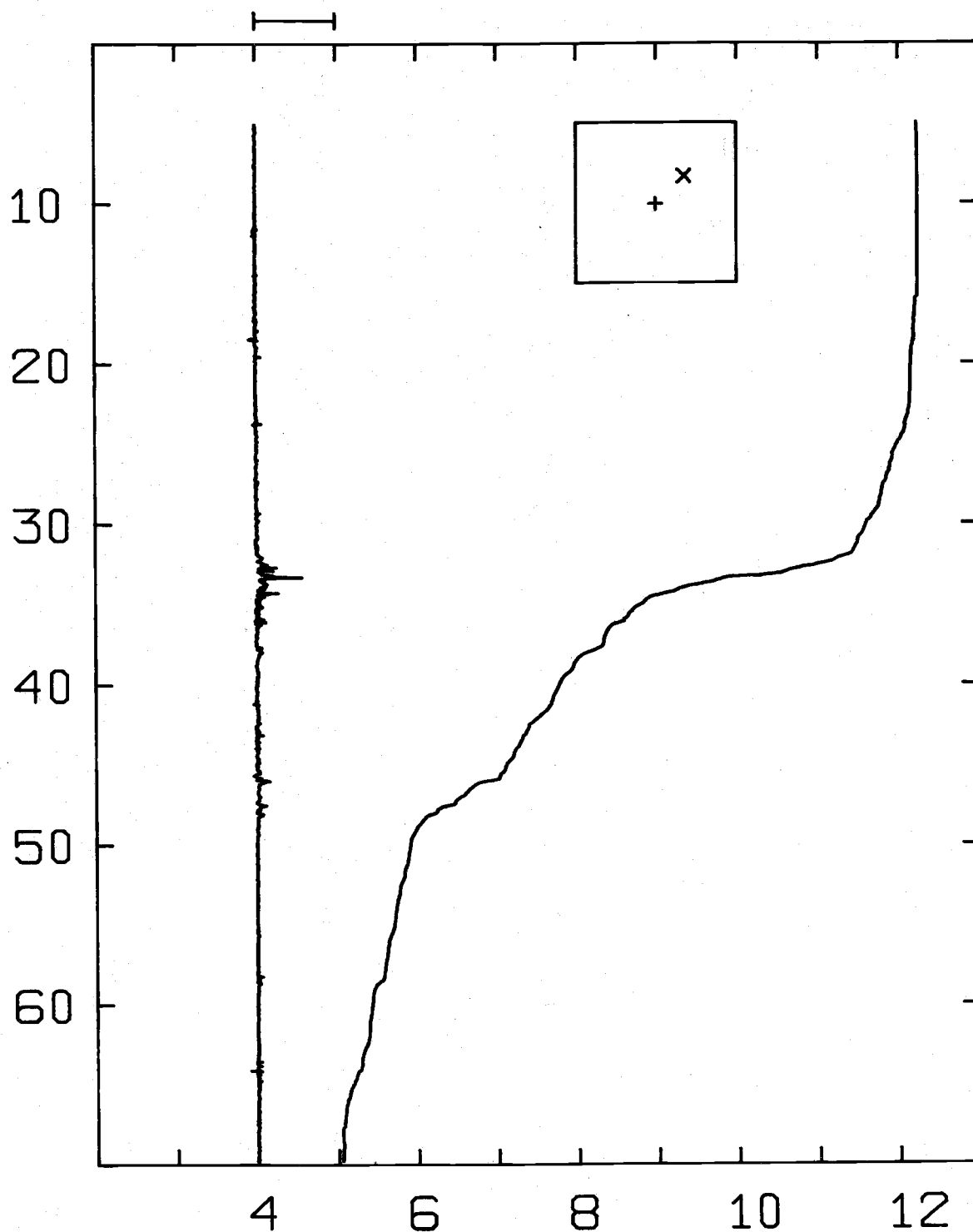
DATE 8/29/77

RANGE 1.85

TIME 0947

BEARING 228

10.0 DEG/M UNIT C P828C3



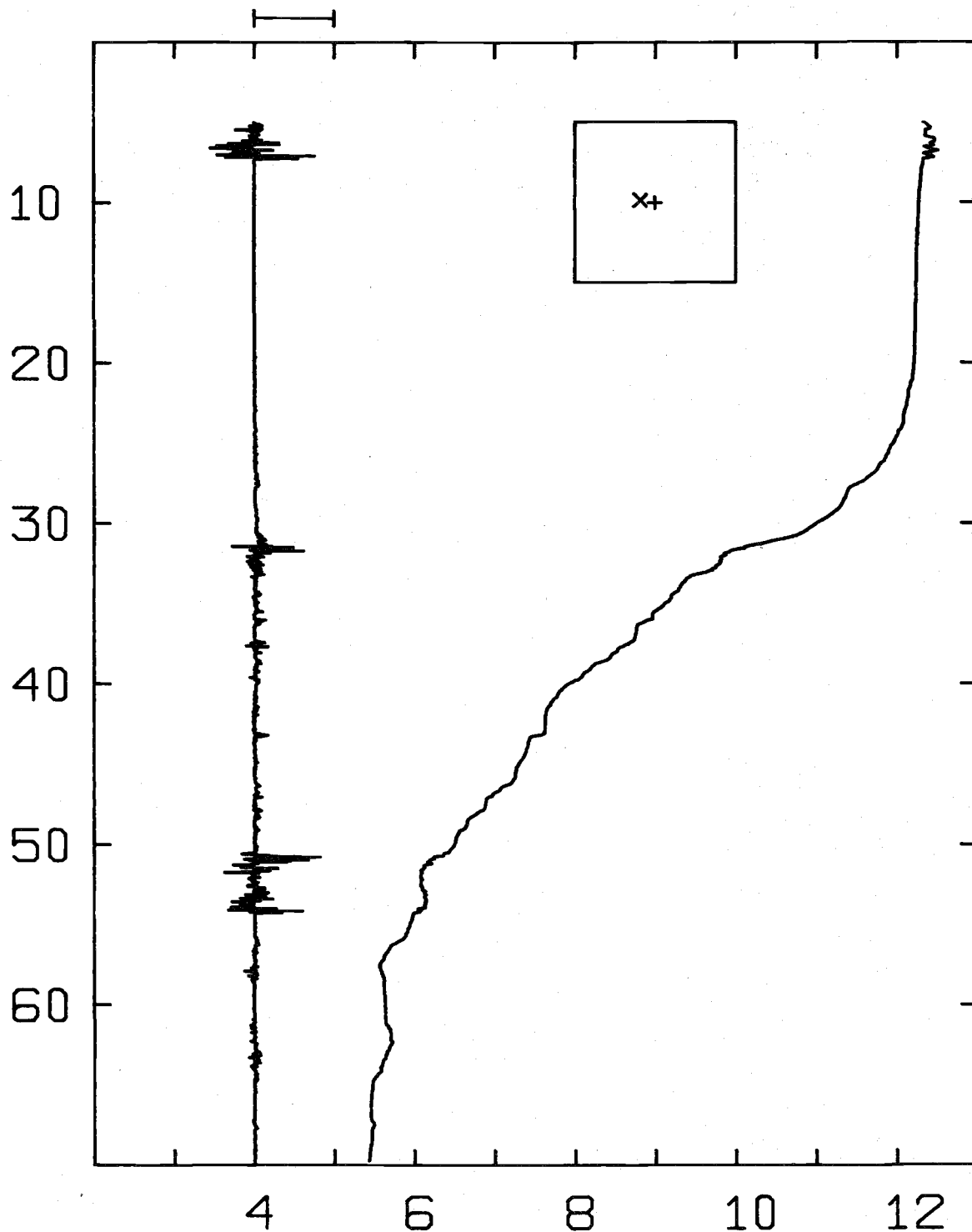
DATE 8/29/77

RANGE 2.45

TIME 1011

BEARING 225

10.0 DEG/M UNIT C P829A1



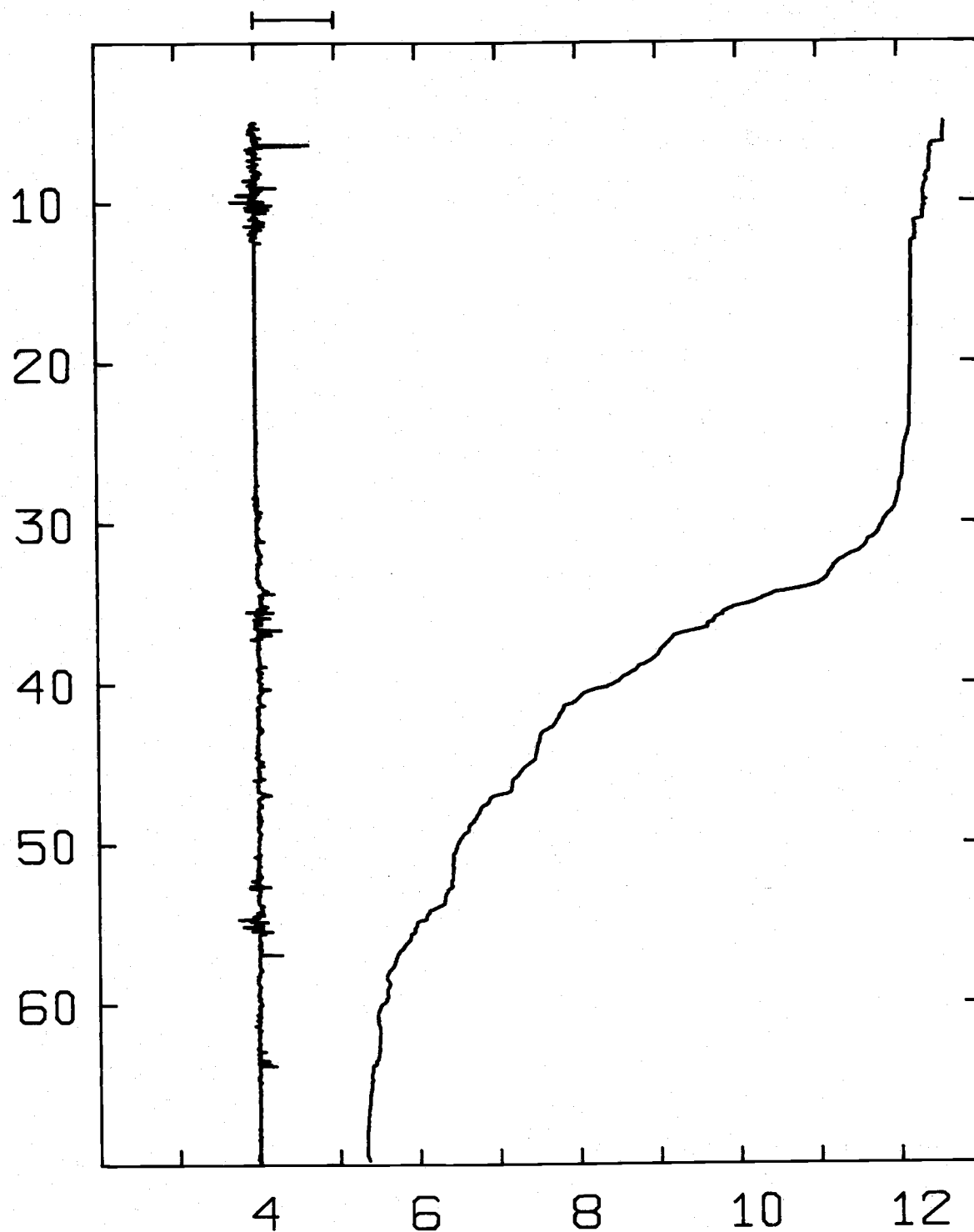
DATE 8/30/77

RANGE .964

TIME 0558

BEARING 99

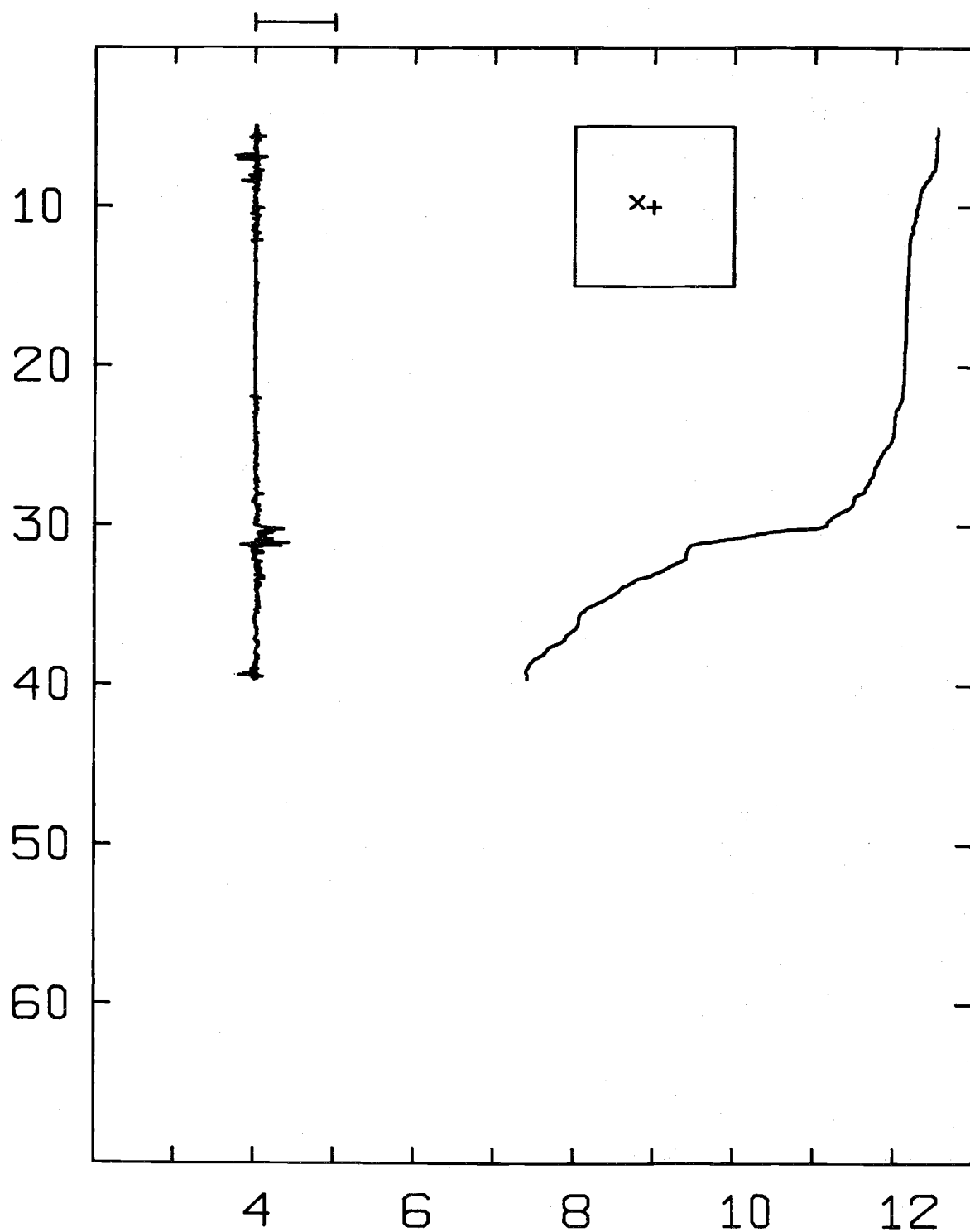
10.0 DEG/M UNIT C P829A2



DATE 8/30/77

TIME 0625

10.0 DEG/M UNIT C P829A3



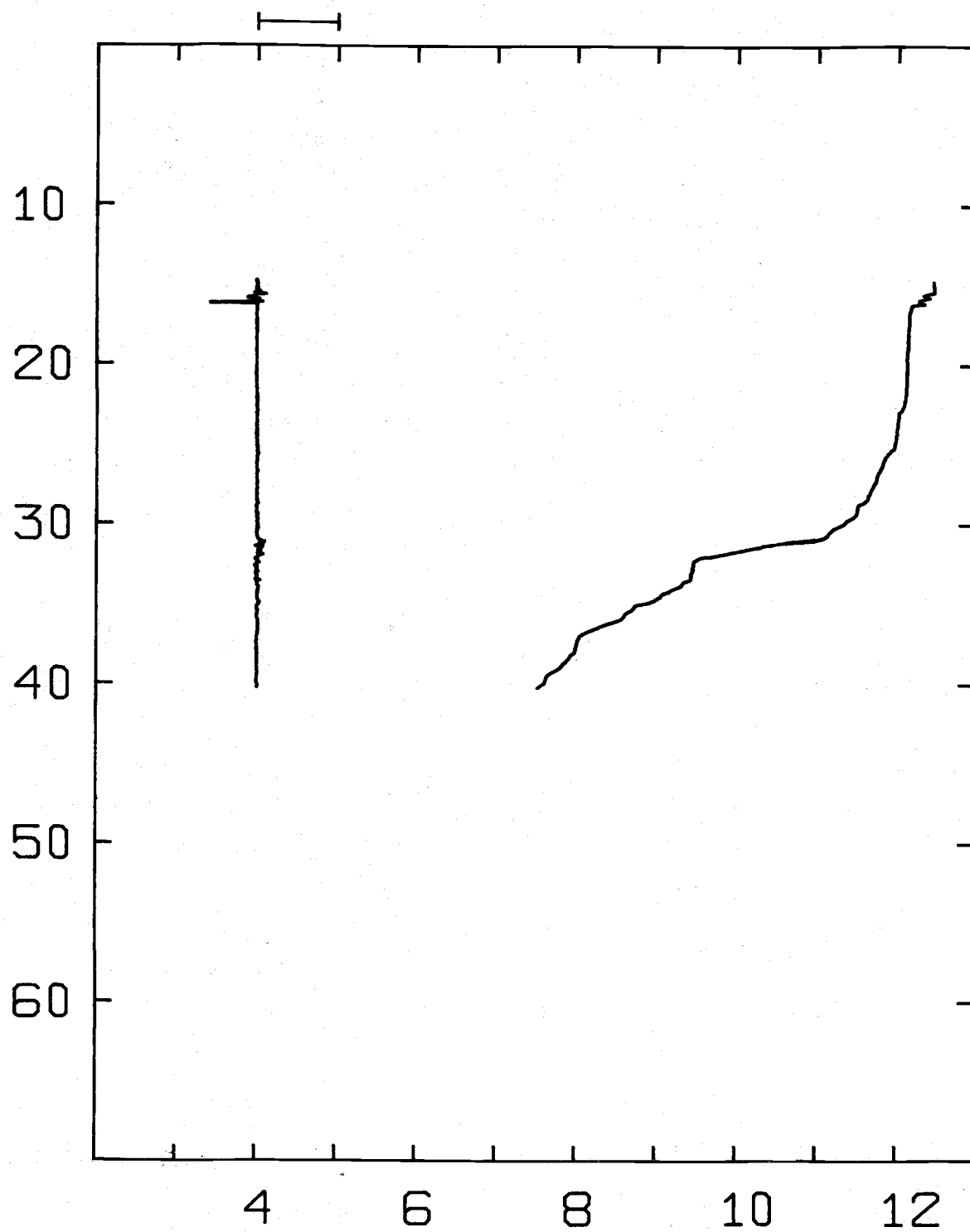
DATE 8/30/77

RANGE 1.15

TIME 0651

BEARING 105

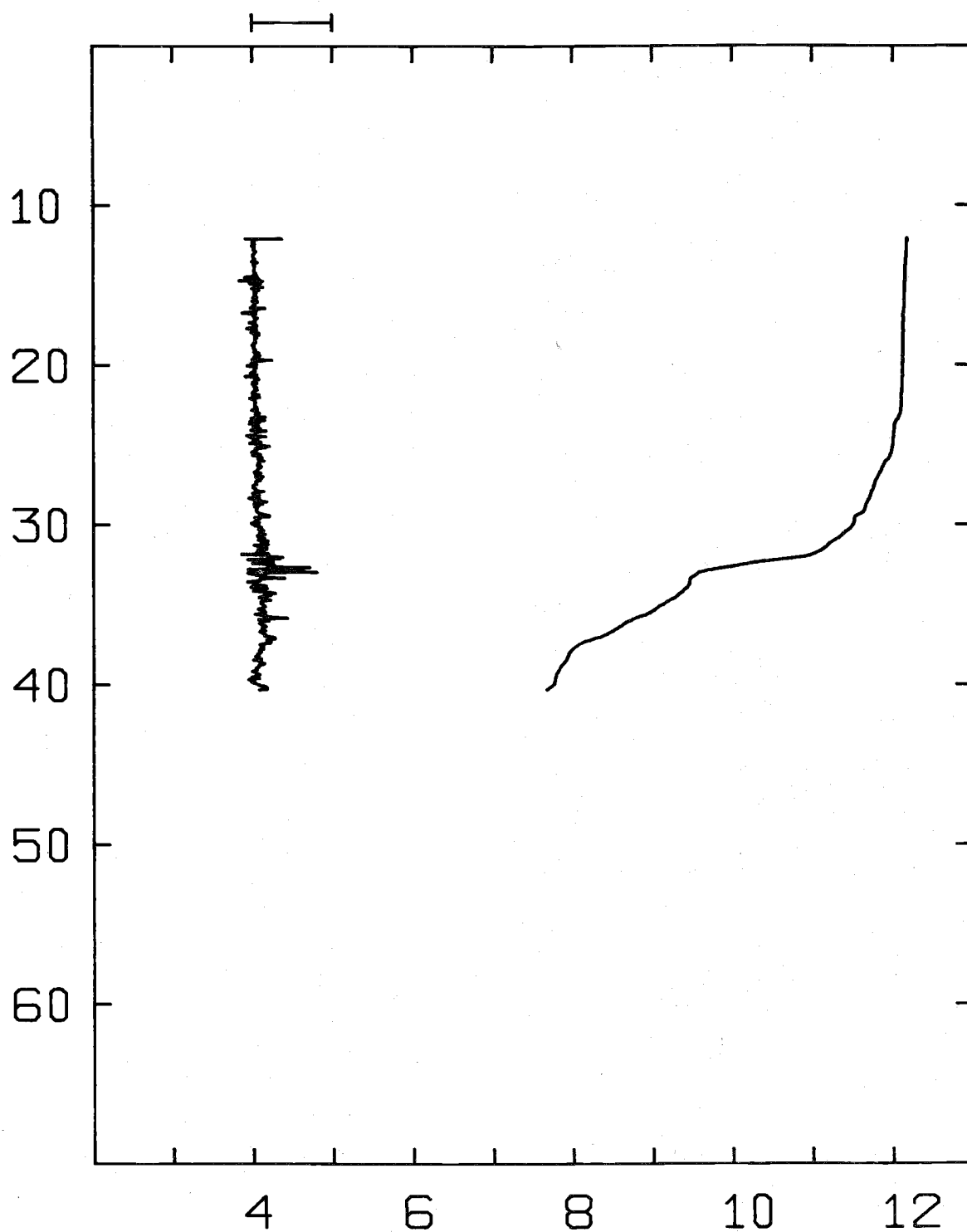
30.0 DEG/M UNIT C P829A4



DATE 8/30/77

TIME 0654

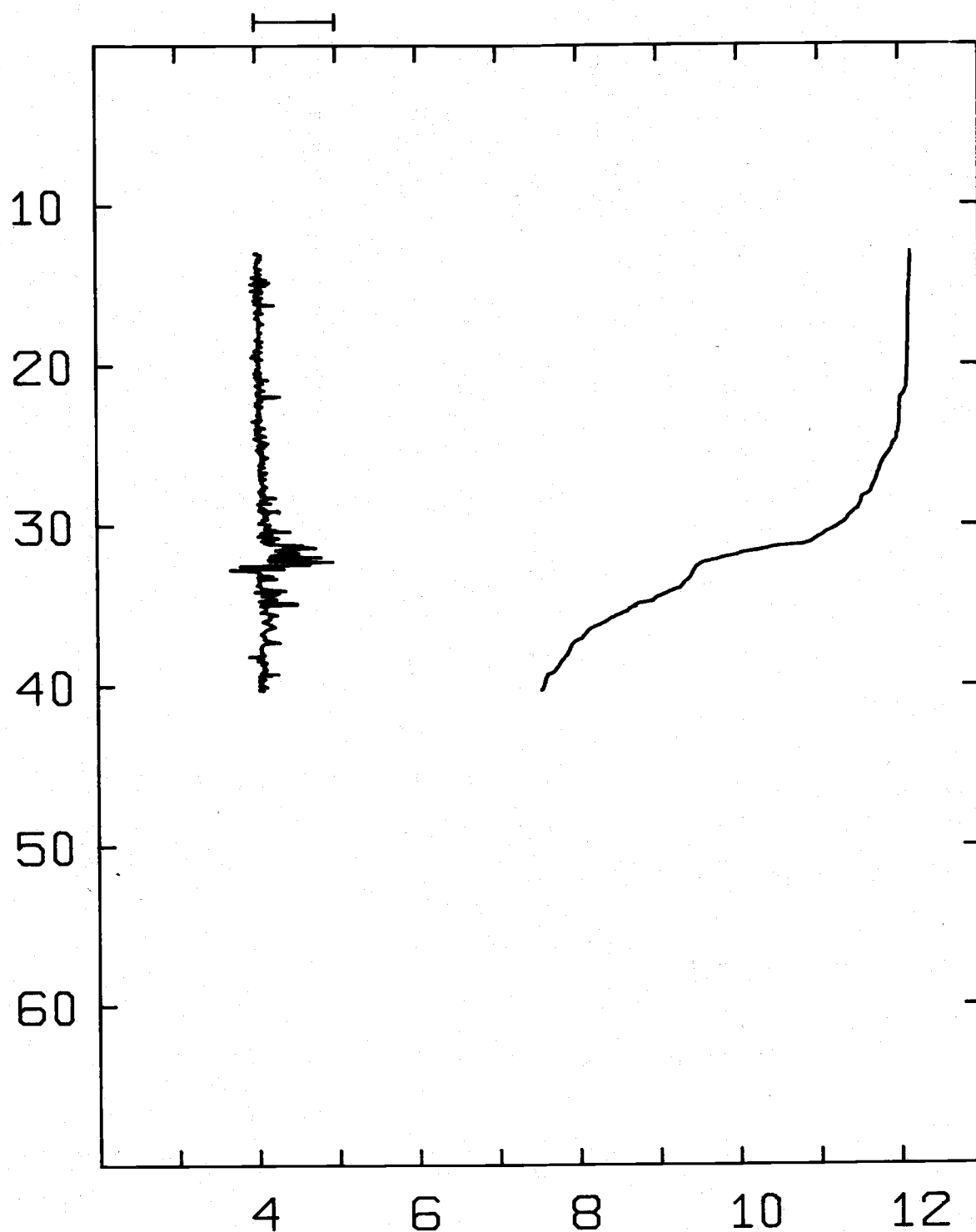
3.00 DEG/M UNIT C P829A5



DATE 8/30/77

TIME 0656

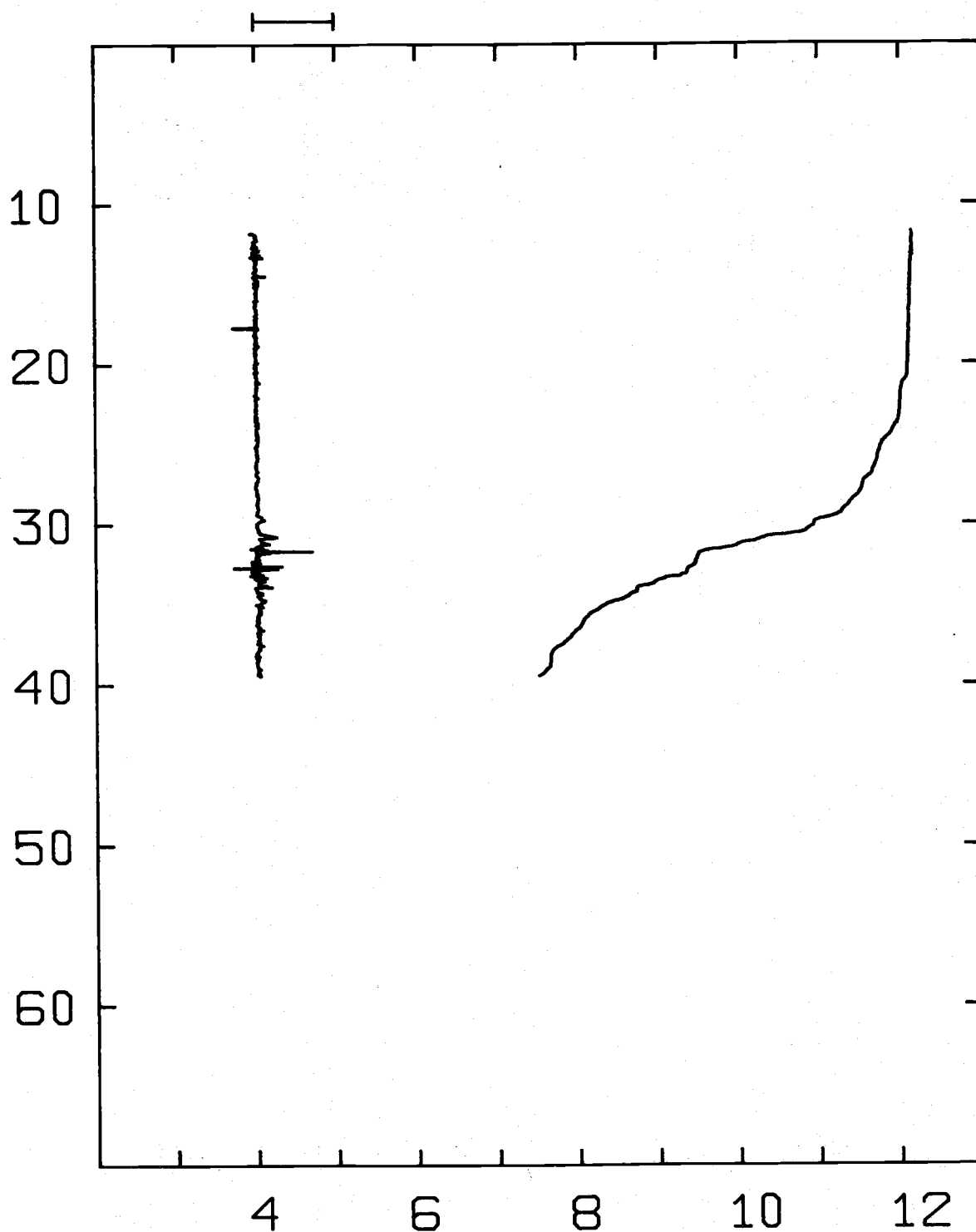
3.00 DEG/M UNIT C P829A6



DATE 8/30/77

TIME 0658

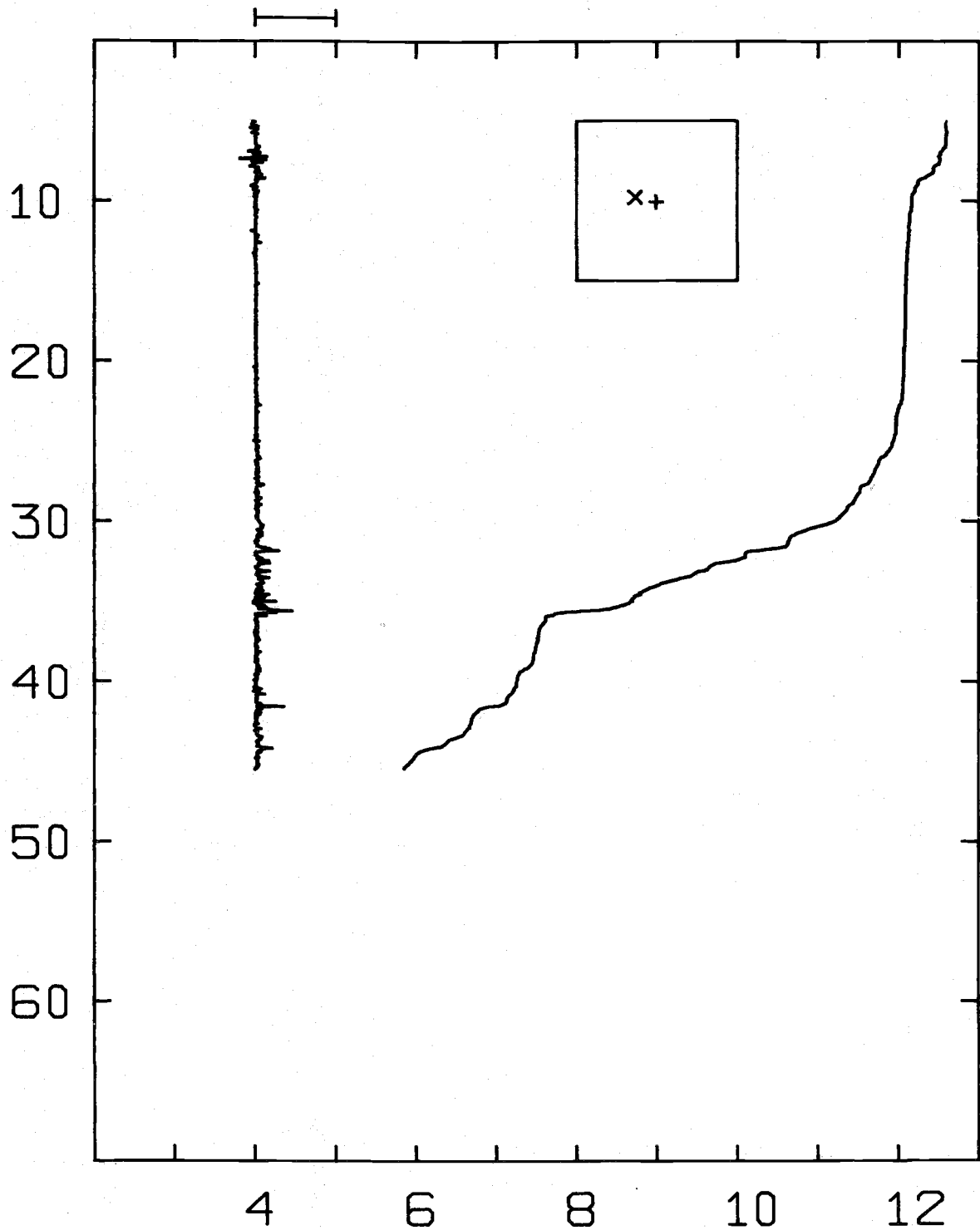
10.0 DEG/M UNIT C P829A7



DATE 8/30/77

TIME 0700

10.0 DEG/M UNIT C P829B1



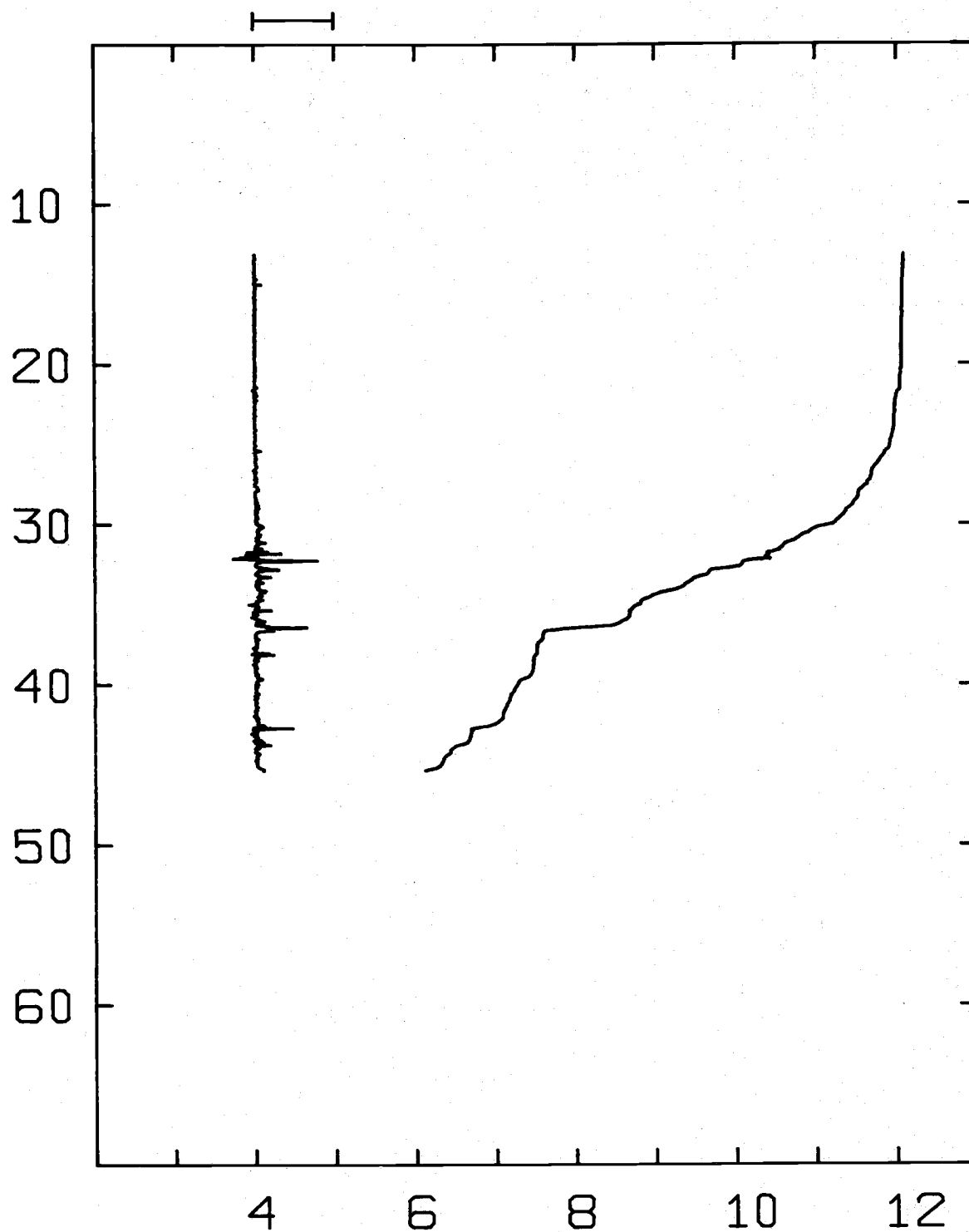
DATE 8/30/77

RANGE 1.35

TIME 0714

BEARING 102

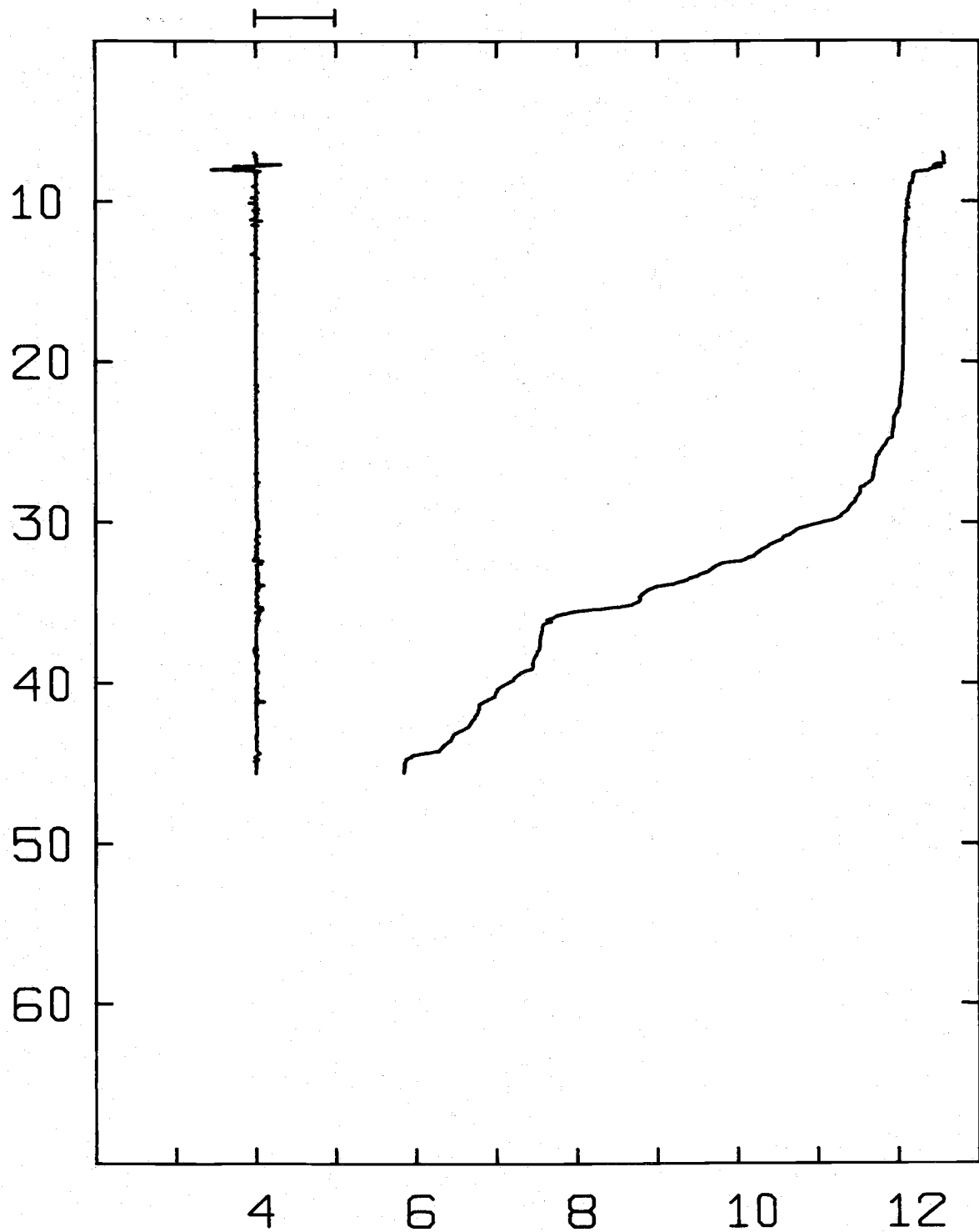
10.0 DEG/M UNIT C P829B2



DATE 8/30/77

TIME 0717

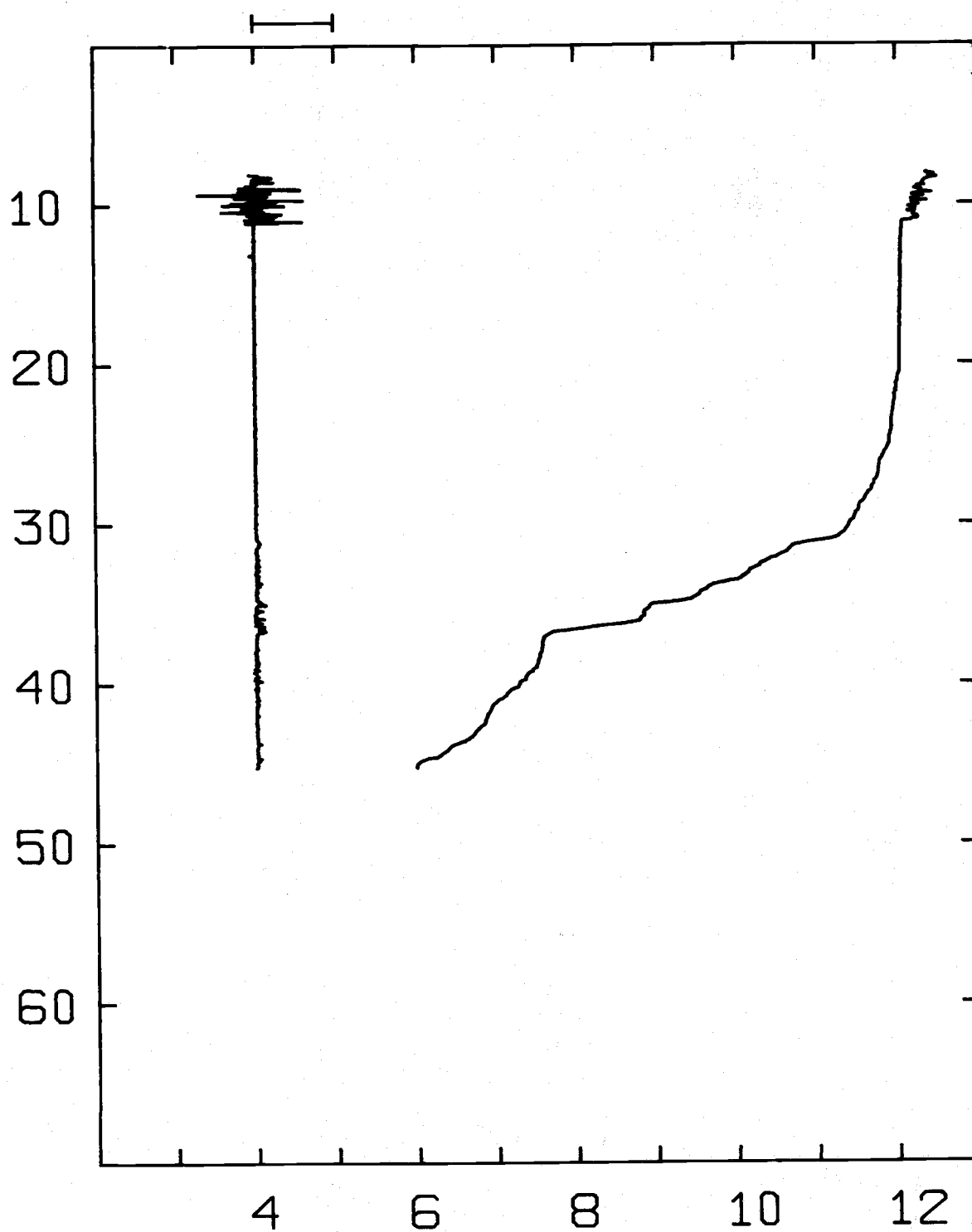
30.0 DEG/M UNIT C P829B3



DATE 8/30/77

TIME 0720

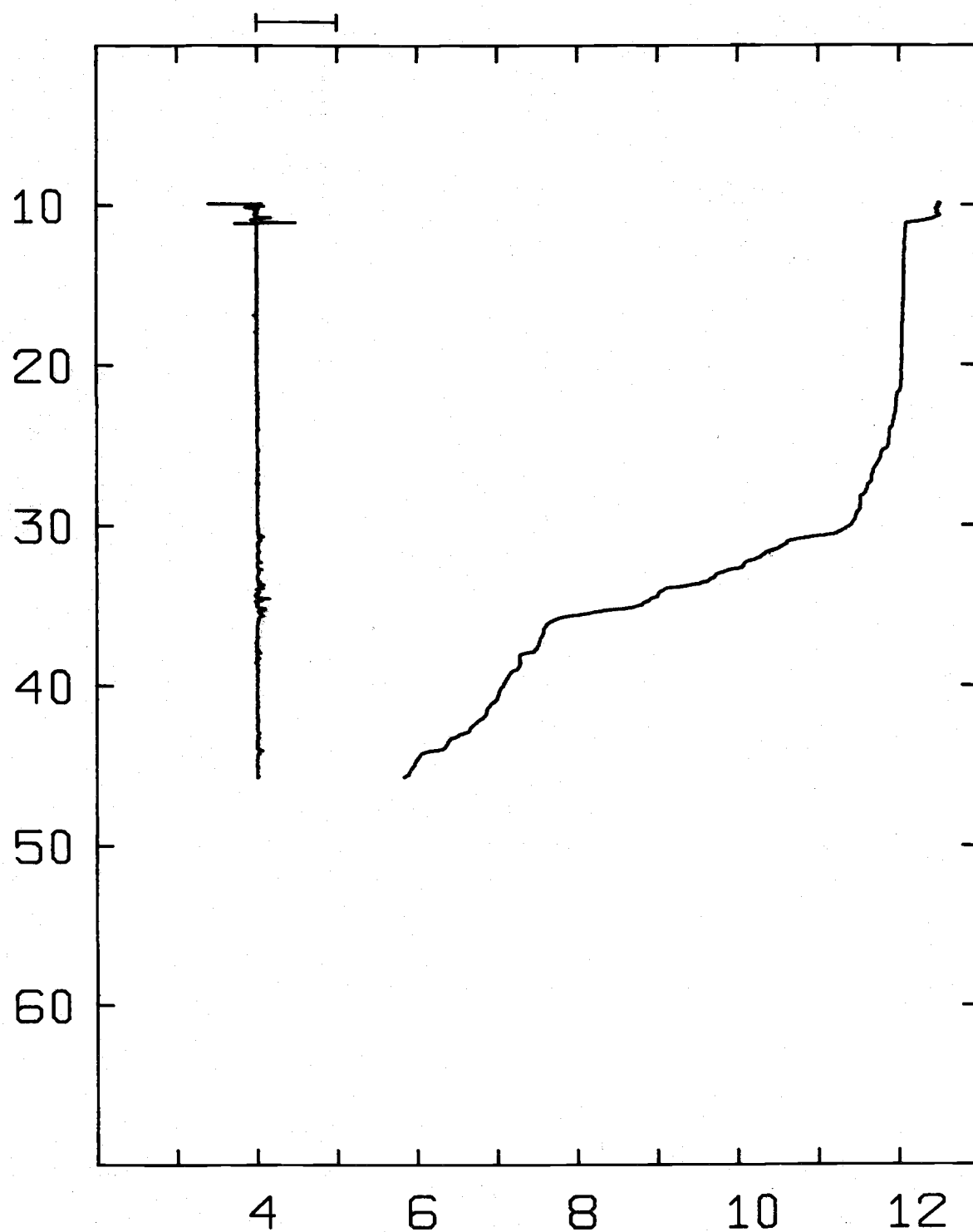
30.0 DEG/M UNIT C P829B4



DATE 8/30/77

TIME 0723

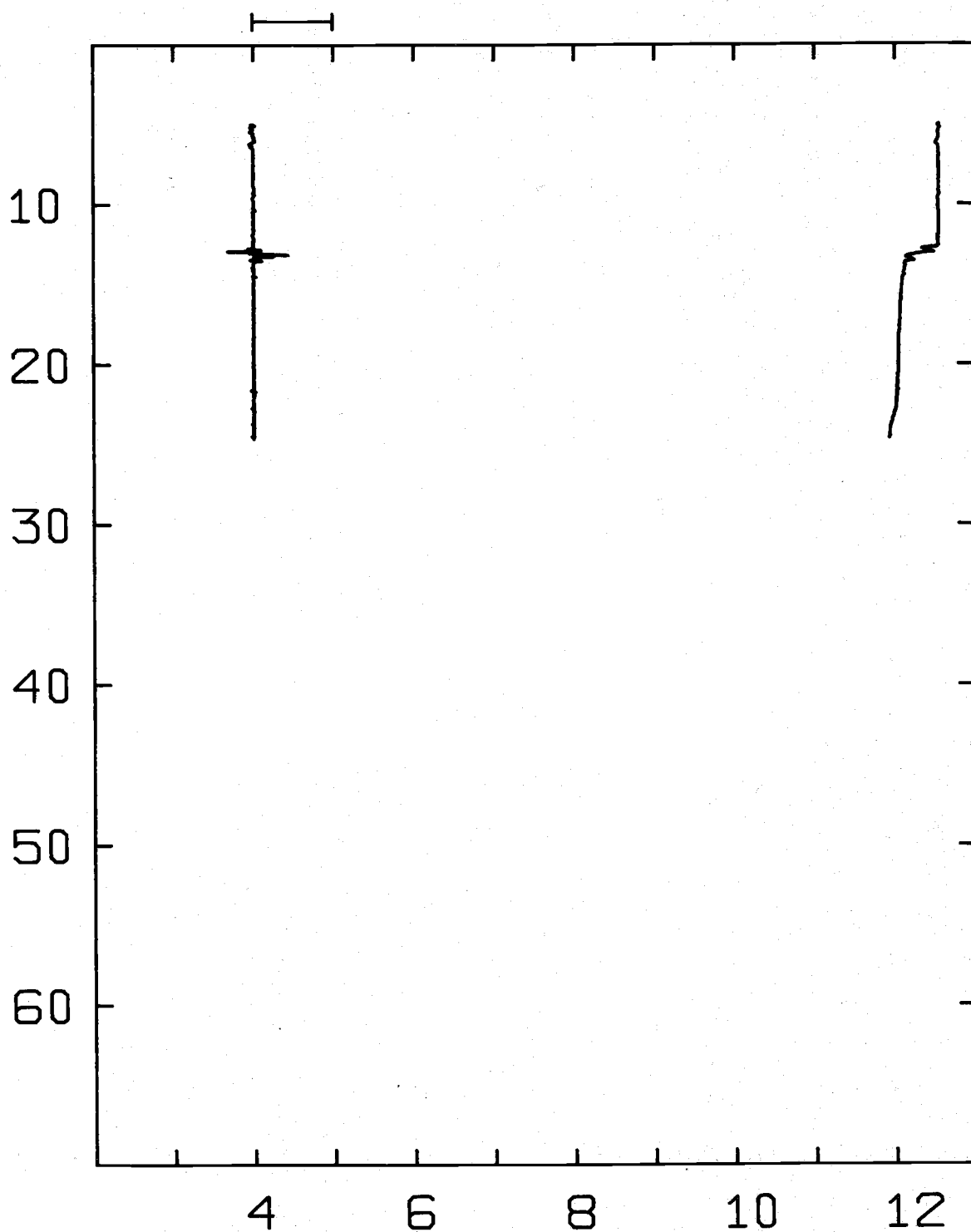
30.0 DEG/M UNIT C P829B5



DATE 8/30/77

TIME 0726

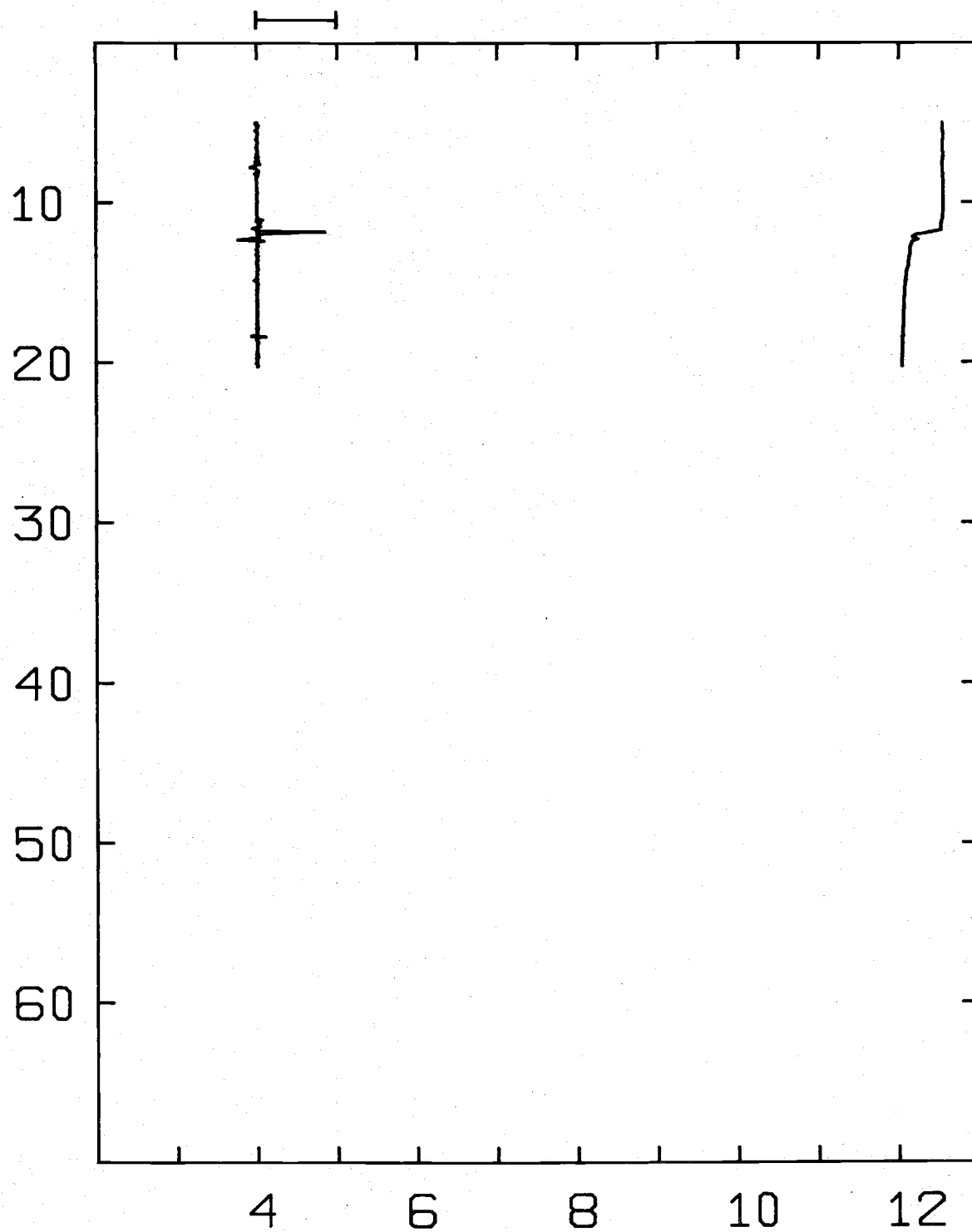
30.0 DEG/M UNIT C P829B6



DATE 8/30/77

TIME 0729

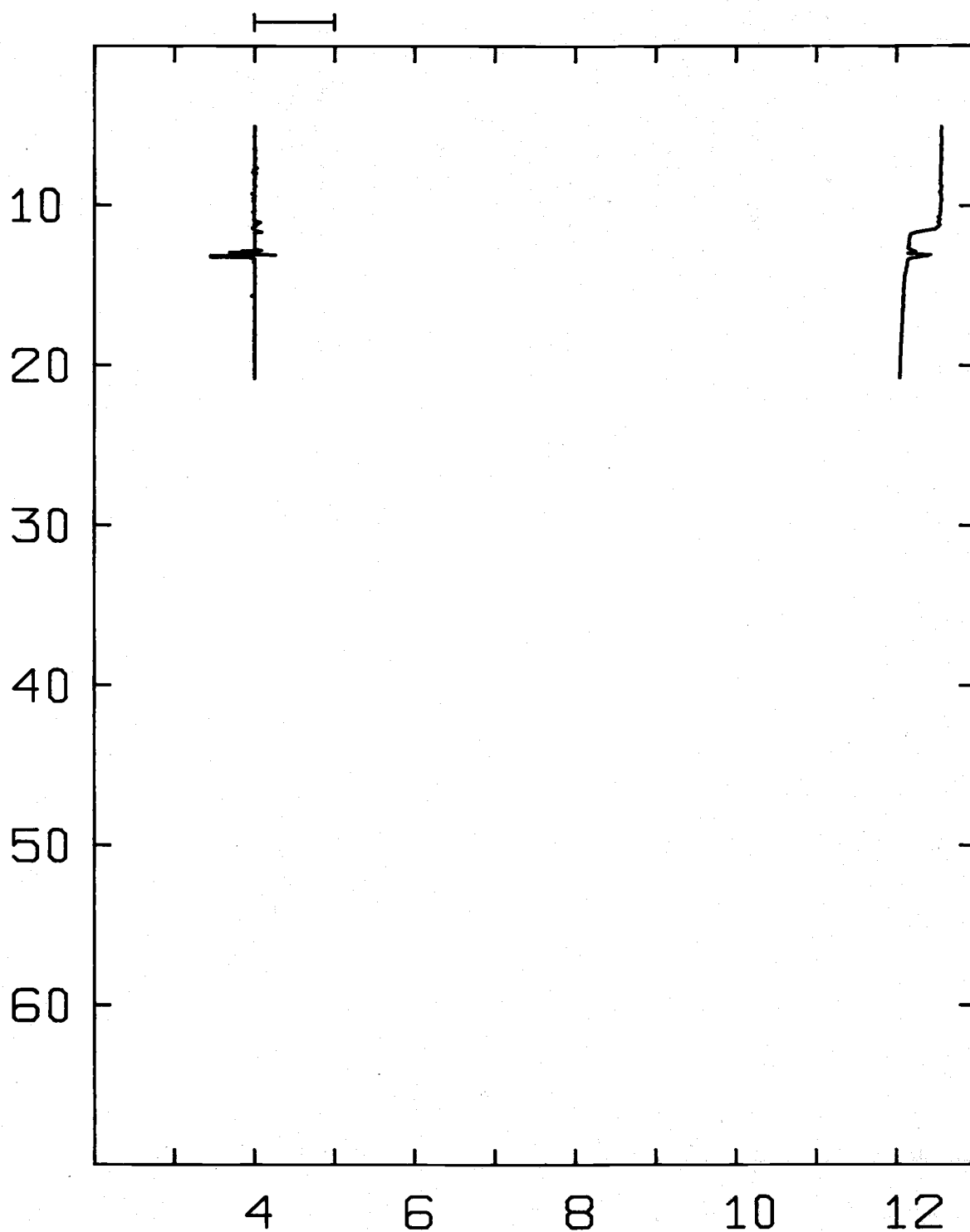
10.0 DEG/M UNIT C P829B7



DATE 8/30/77

TIME 0731

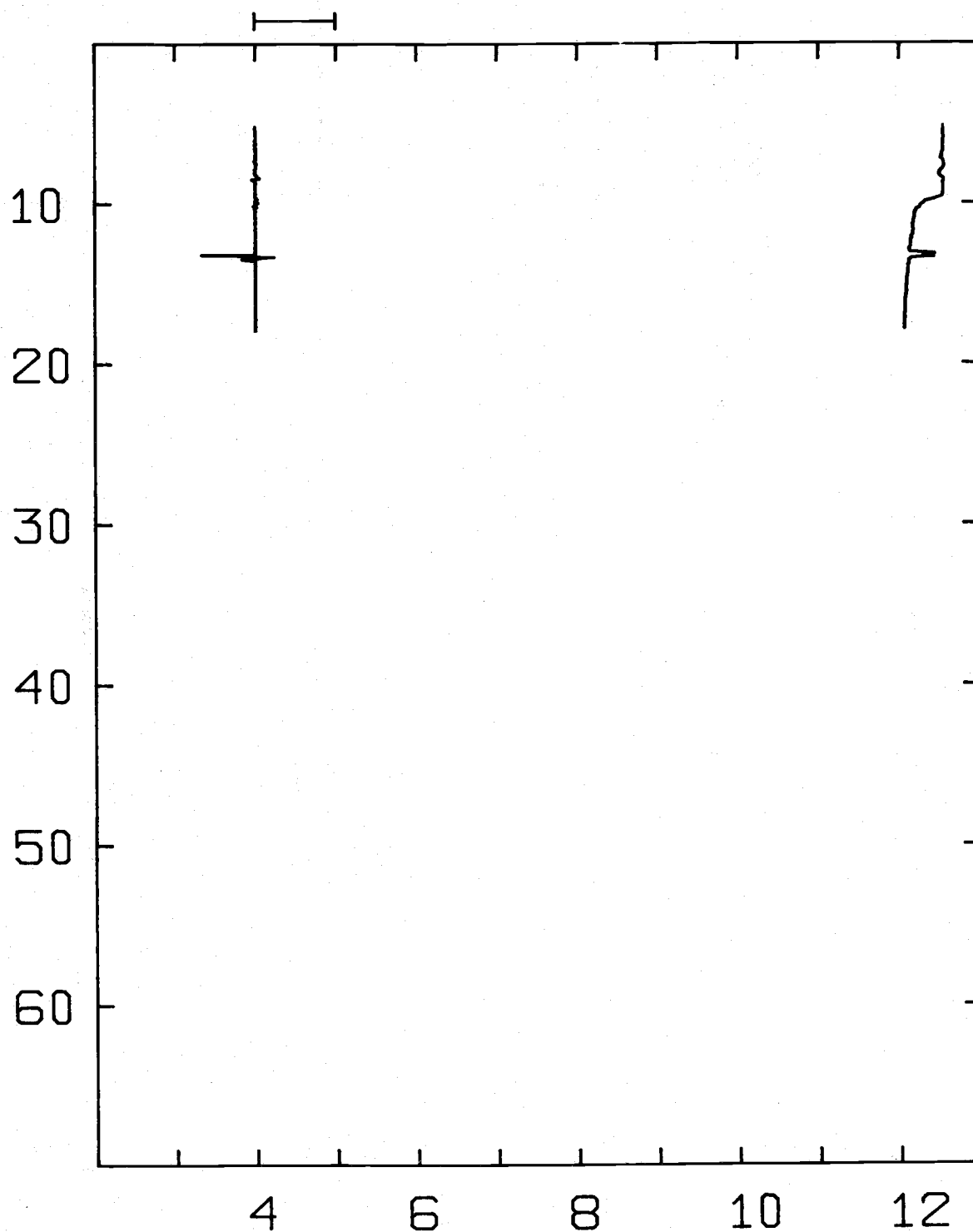
30.0 DEG/M UNIT C P829B8



DATE 8/30/77

TIME 0734

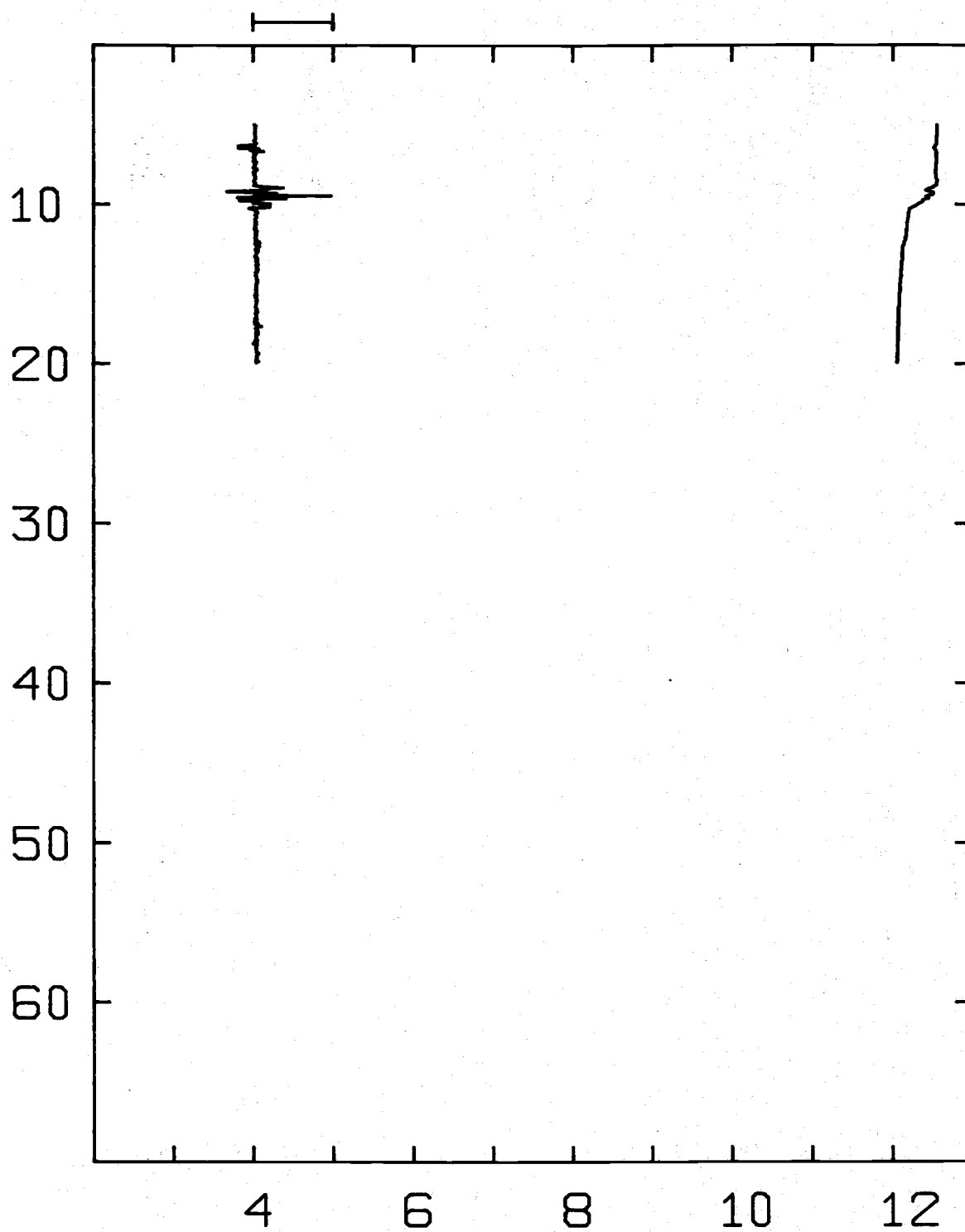
30.0 DEG/M UNIT C P829B9



DATE 8/30/77

TIME 0736

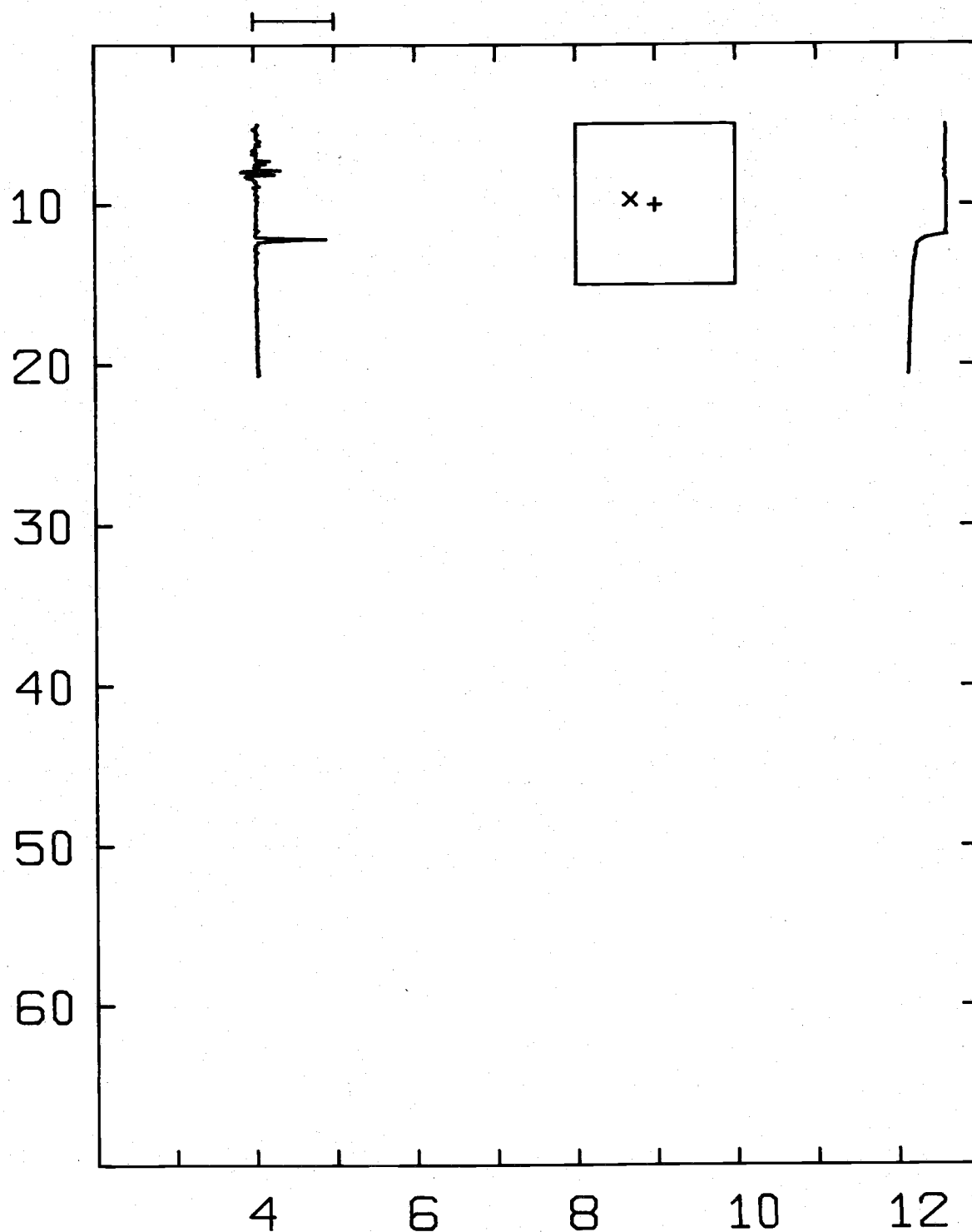
3.00 DEG/M UNIT C P829B10



DATE 8/30/77

TIME 0737

3.00 DEG/M UNIT C P829B11



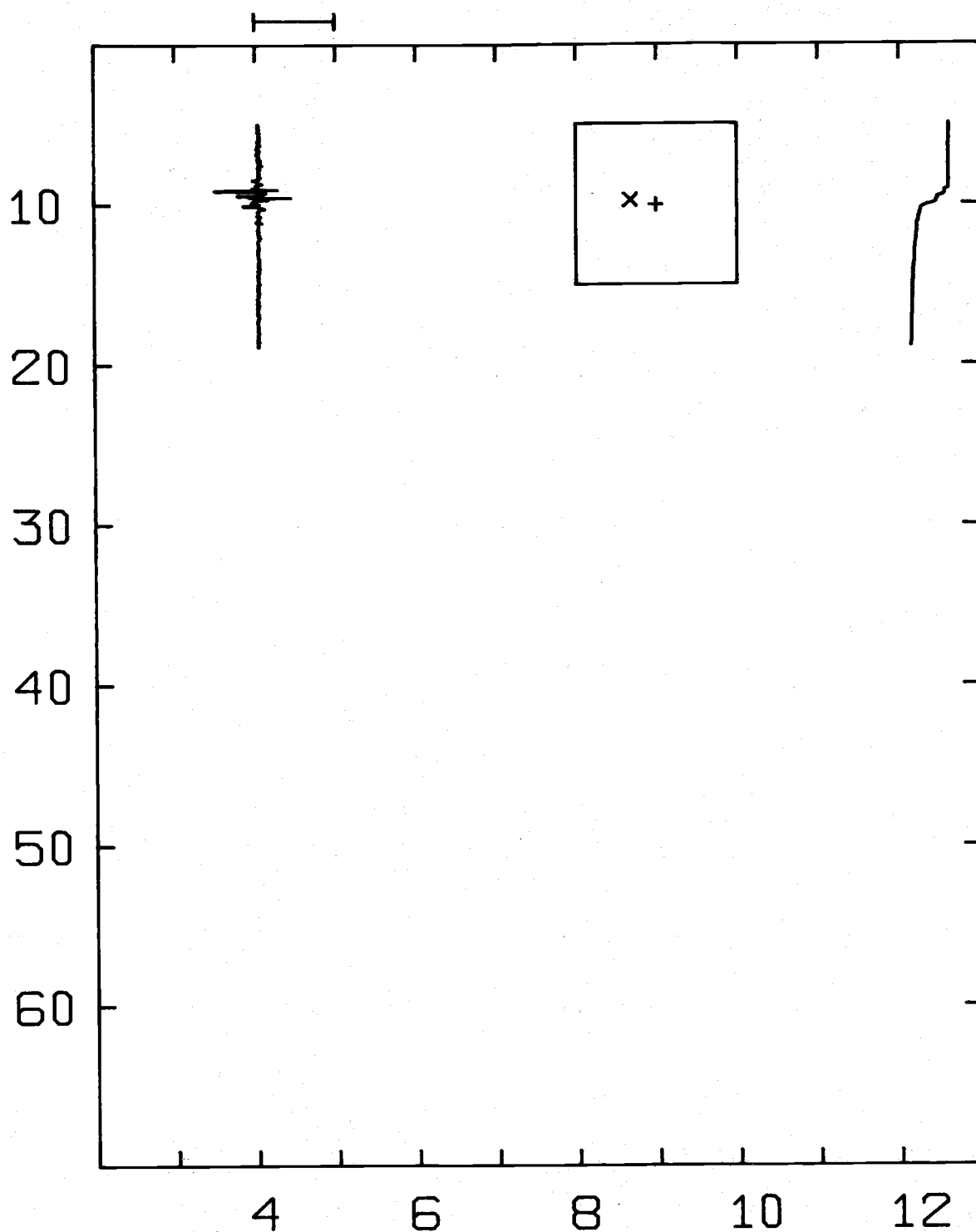
DATE 8/30/77

RANGE 1.59

TIME 0747

BEARING 102

3.00 DEG/M UNIT C P829B12



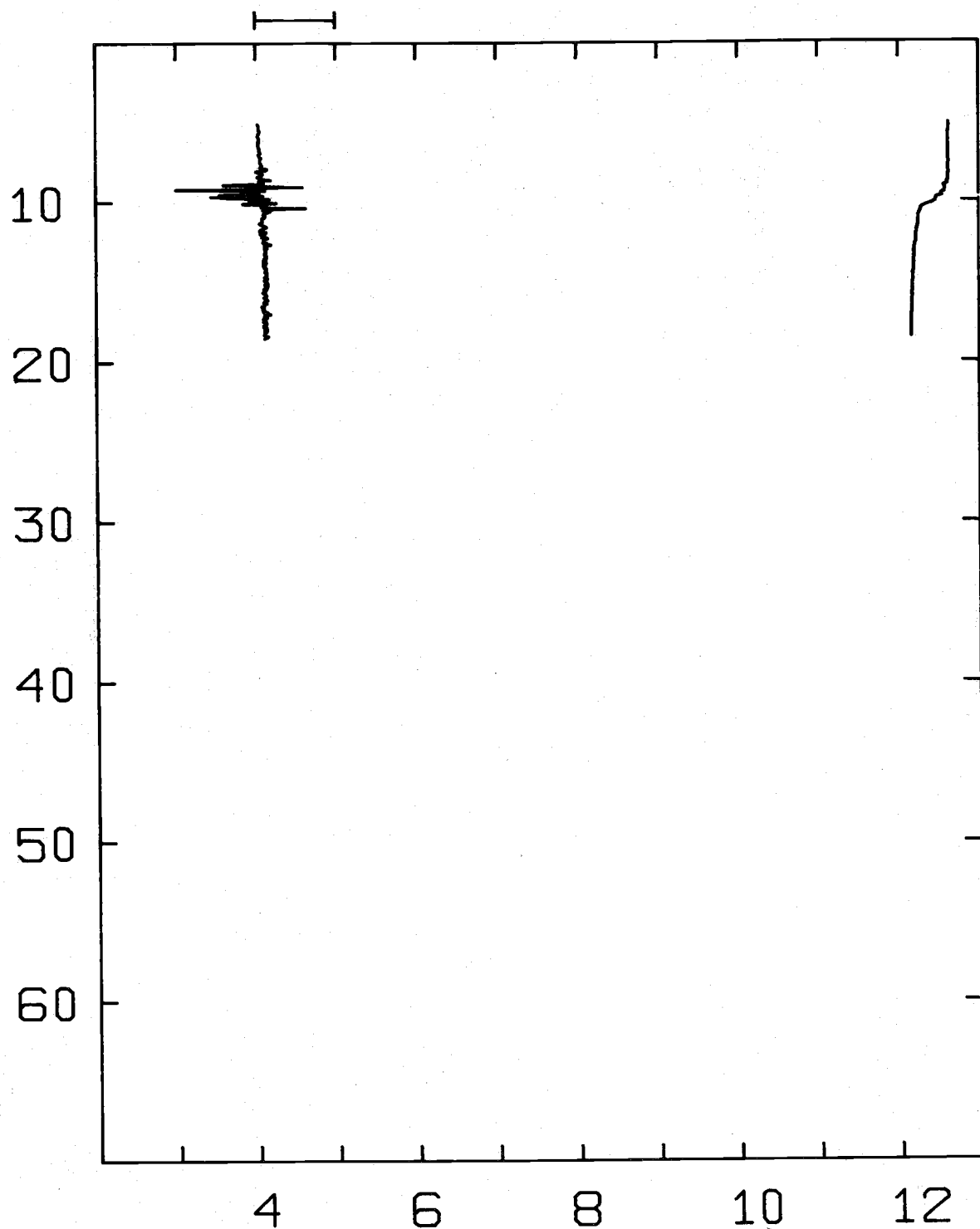
DATE 8/30/77

RANGE 1.63

TIME 0749

BEARING 100

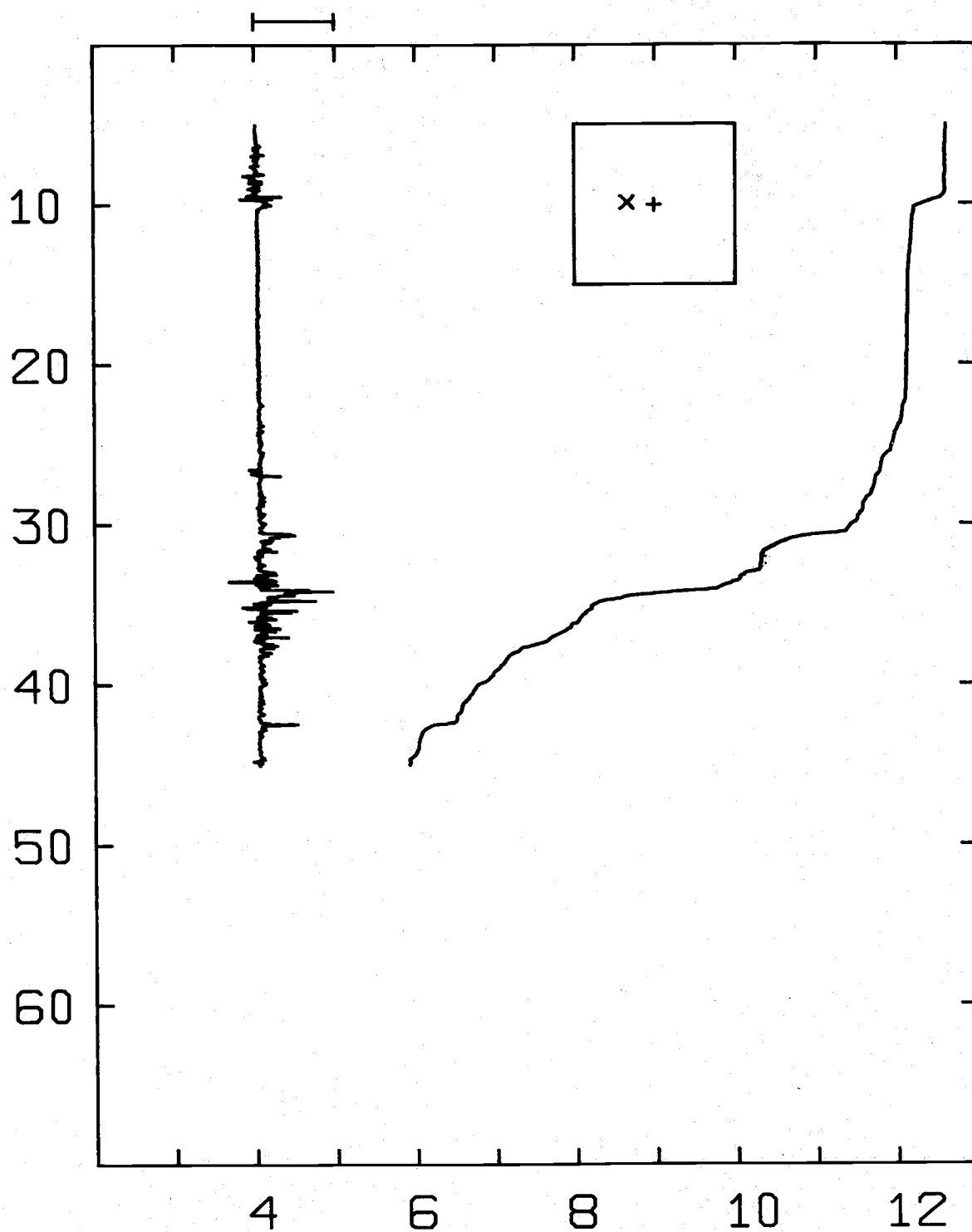
1.00 DEG/M UNIT C P829B13



DATE 8/30/77

TIME 0750

3.00 DEG/M UNIT C P829B20



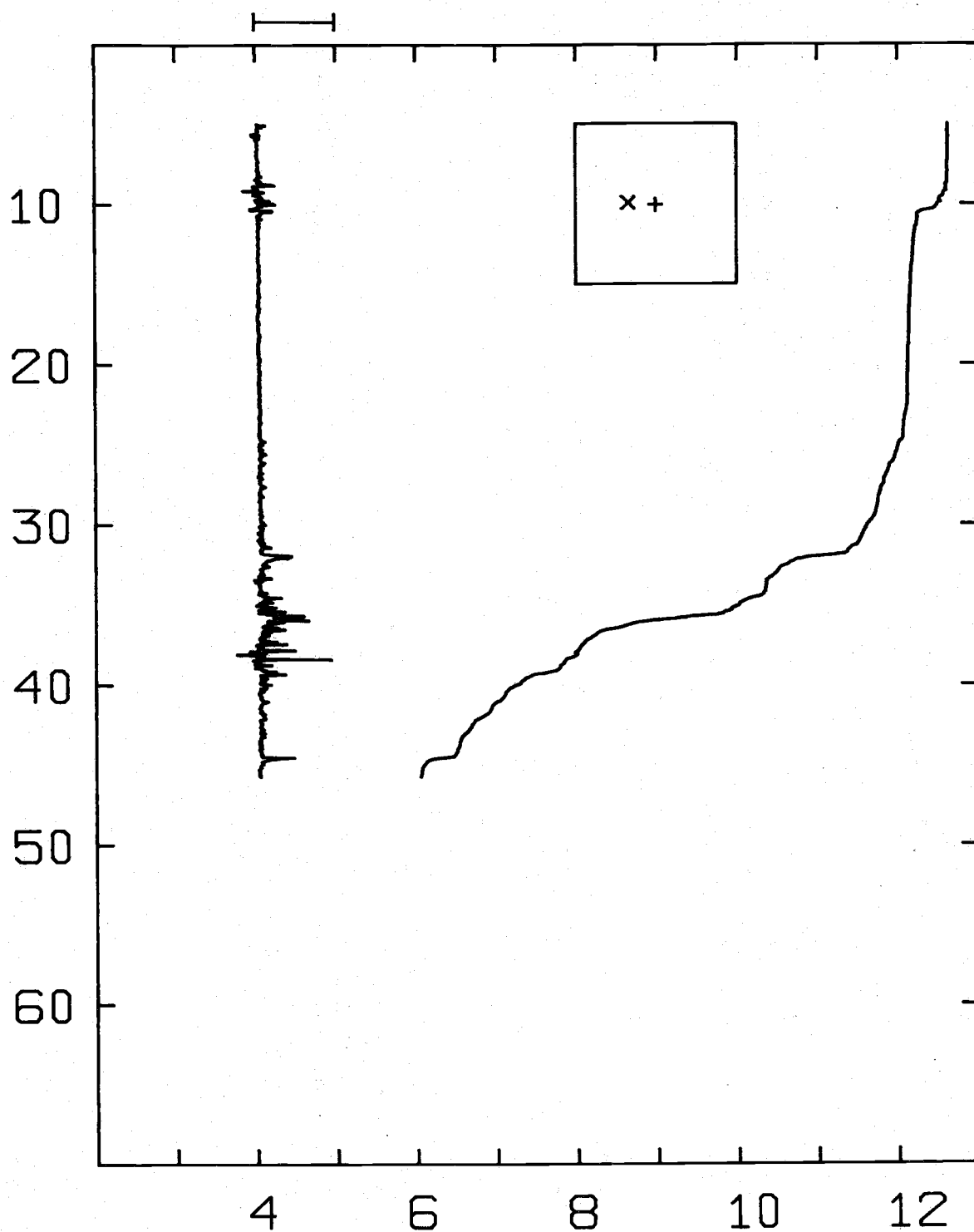
DATE 8/30/77

RANGE 1.72

TIME 0801

BEARING 95

3.00 DEG/M UNIT C P829B21



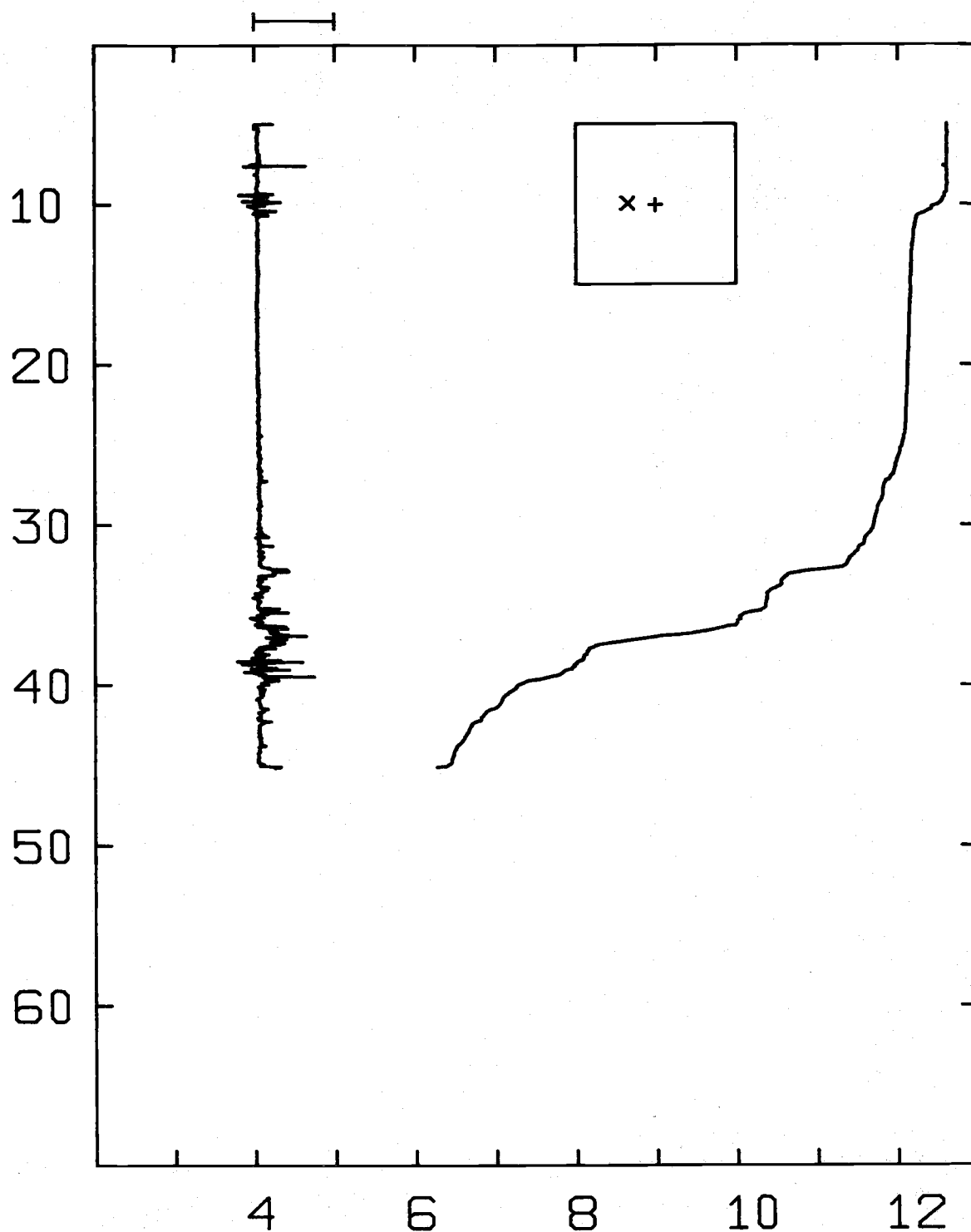
DATE 8/30/77

RANGE 1.74

TIME 0806

BEARING 94

3.00 DEG/M UNIT C P829B22



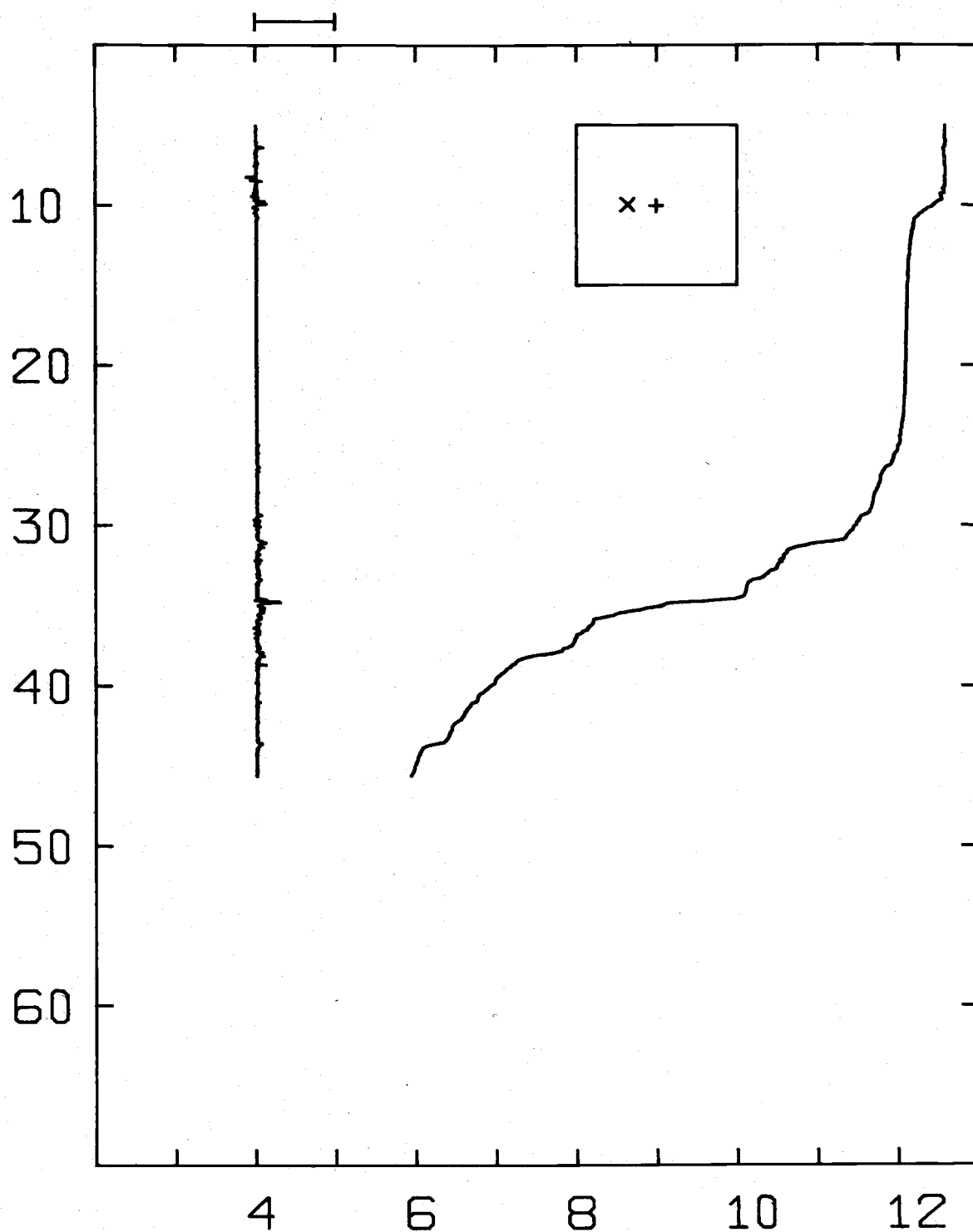
DATE 8/30/77

RANGE 1.78

TIME 0810

BEARING 93

10.0 DEG/M UNIT C P829B23



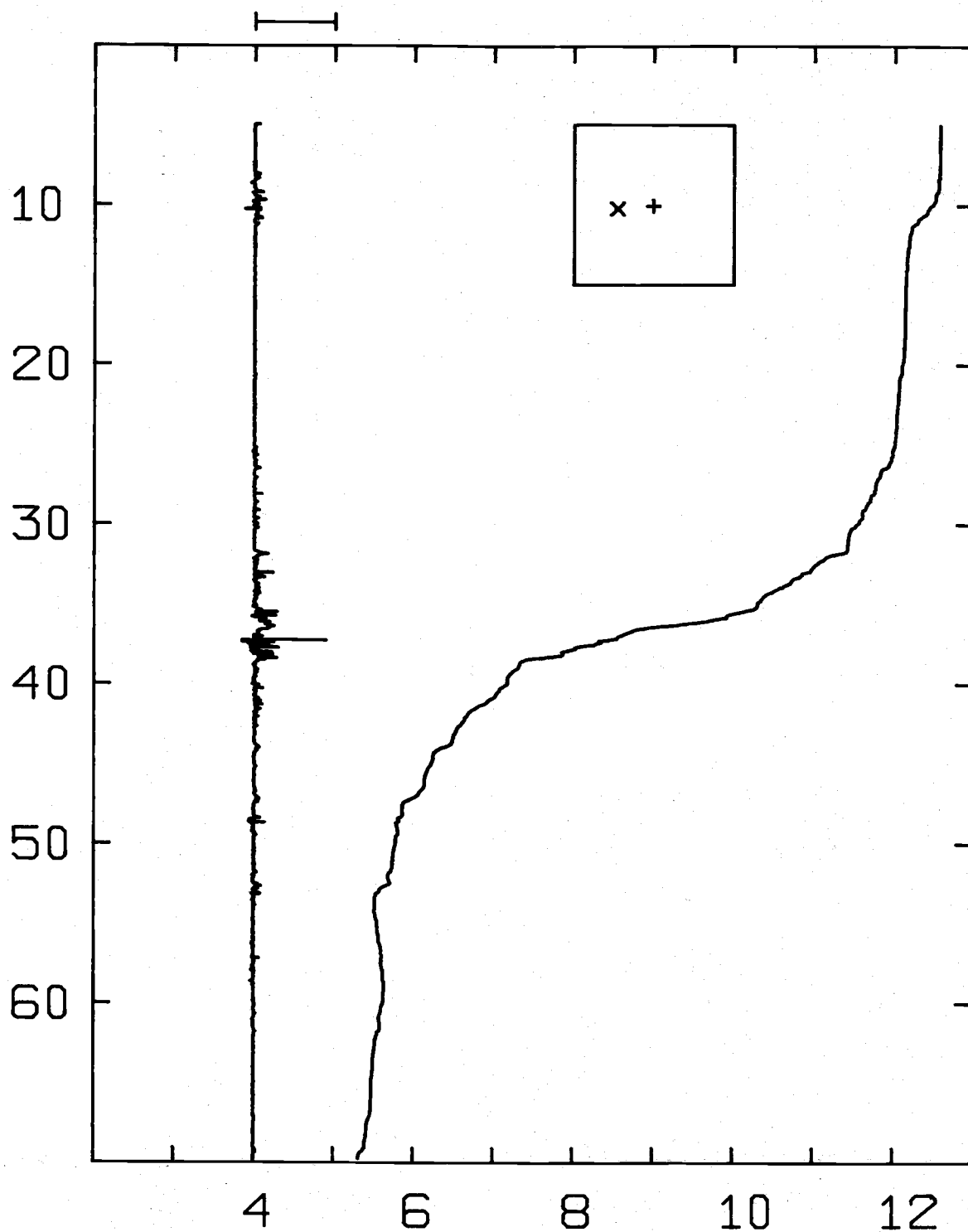
DATE 8/30/77

RANGE 1.82

TIME 0814

BEARING 92

10.0 DEG/M UNIT C P829C1



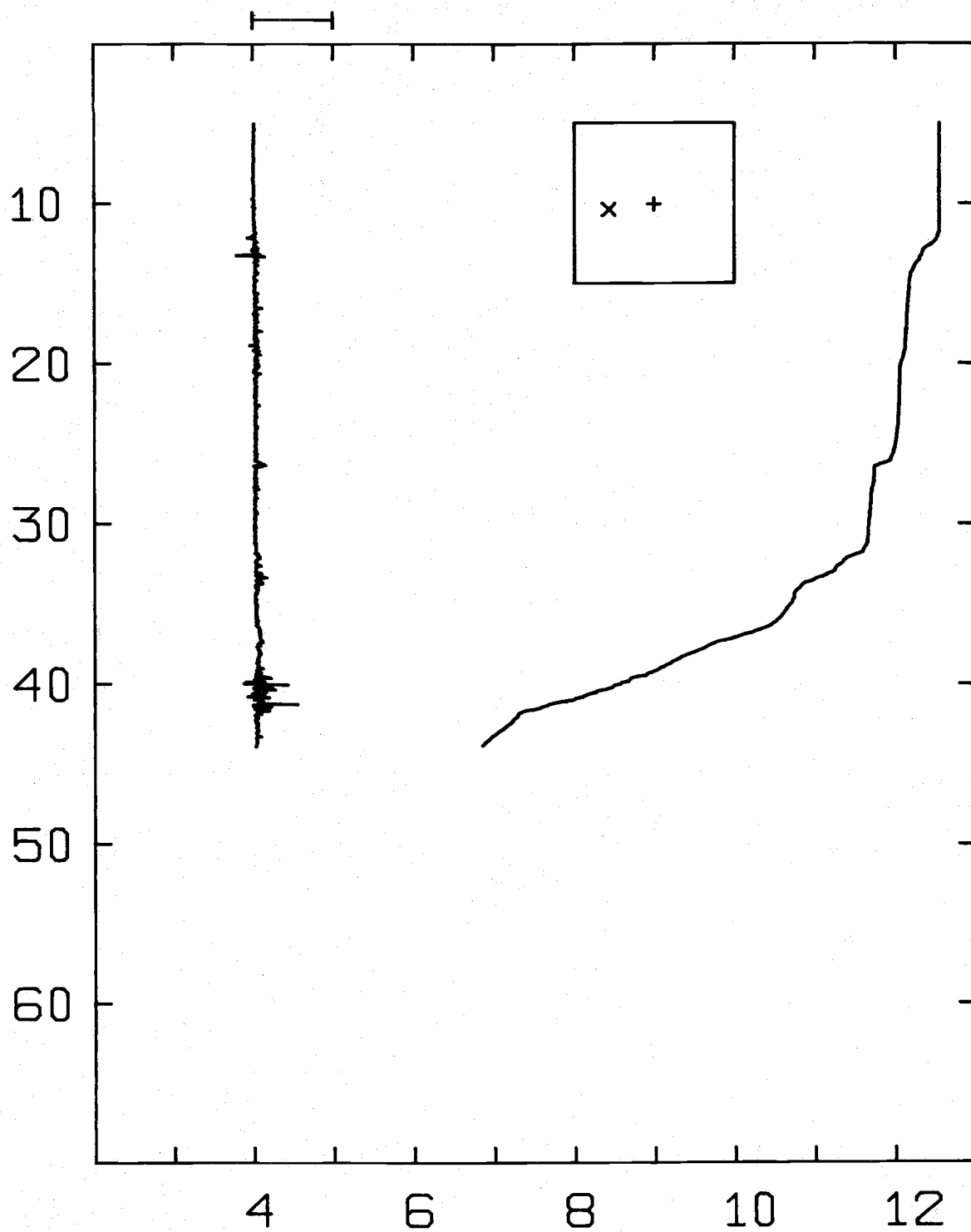
DATE 8/30/77

RANGE 2.28

TIME 0855

BEARING 85

10.0 DEG/M UNIT C P829C2



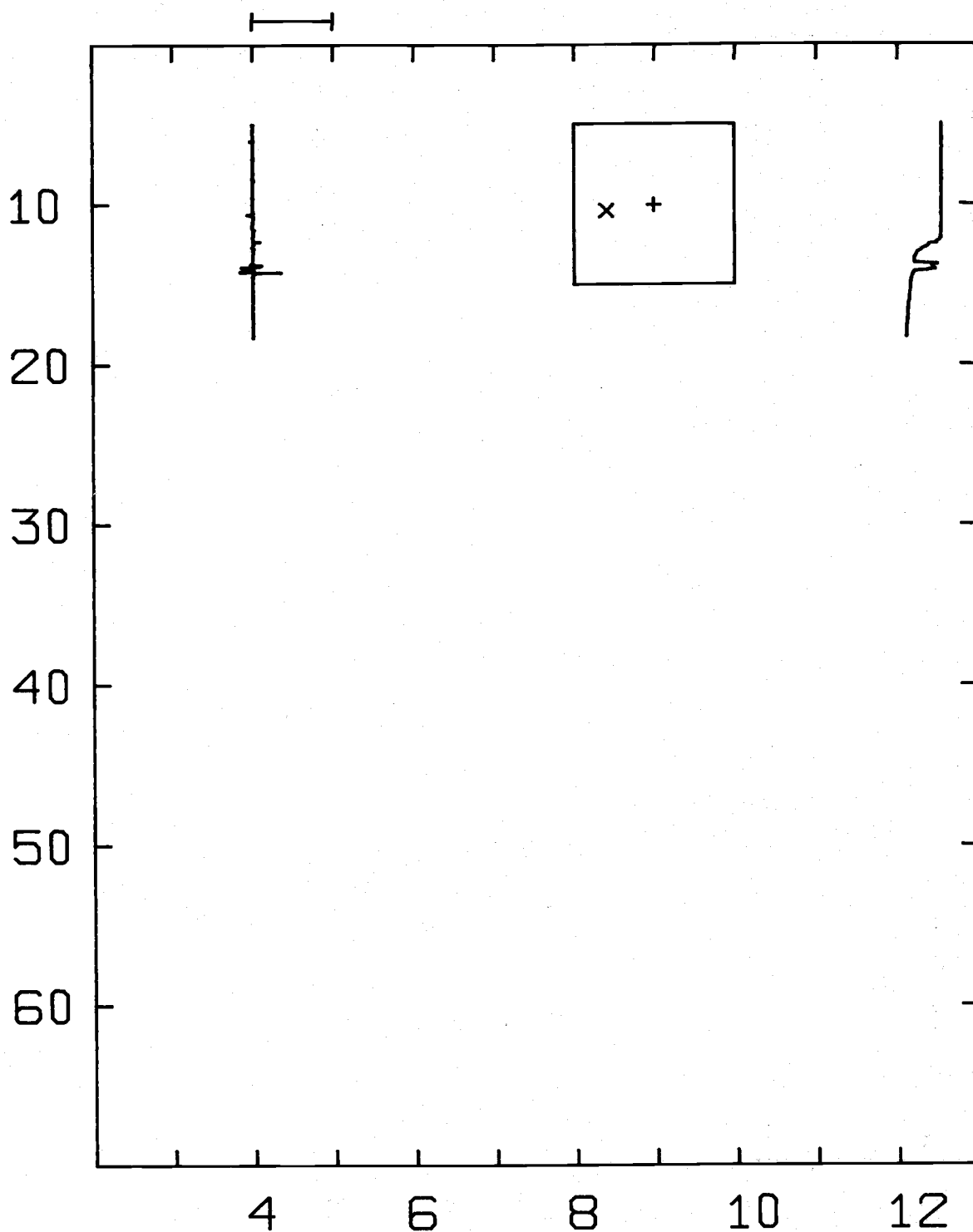
DATE 8/30/77

RANGE 2.87

TIME 0925

BEARING 83

30.0 DEG/M UNIT C P829C3



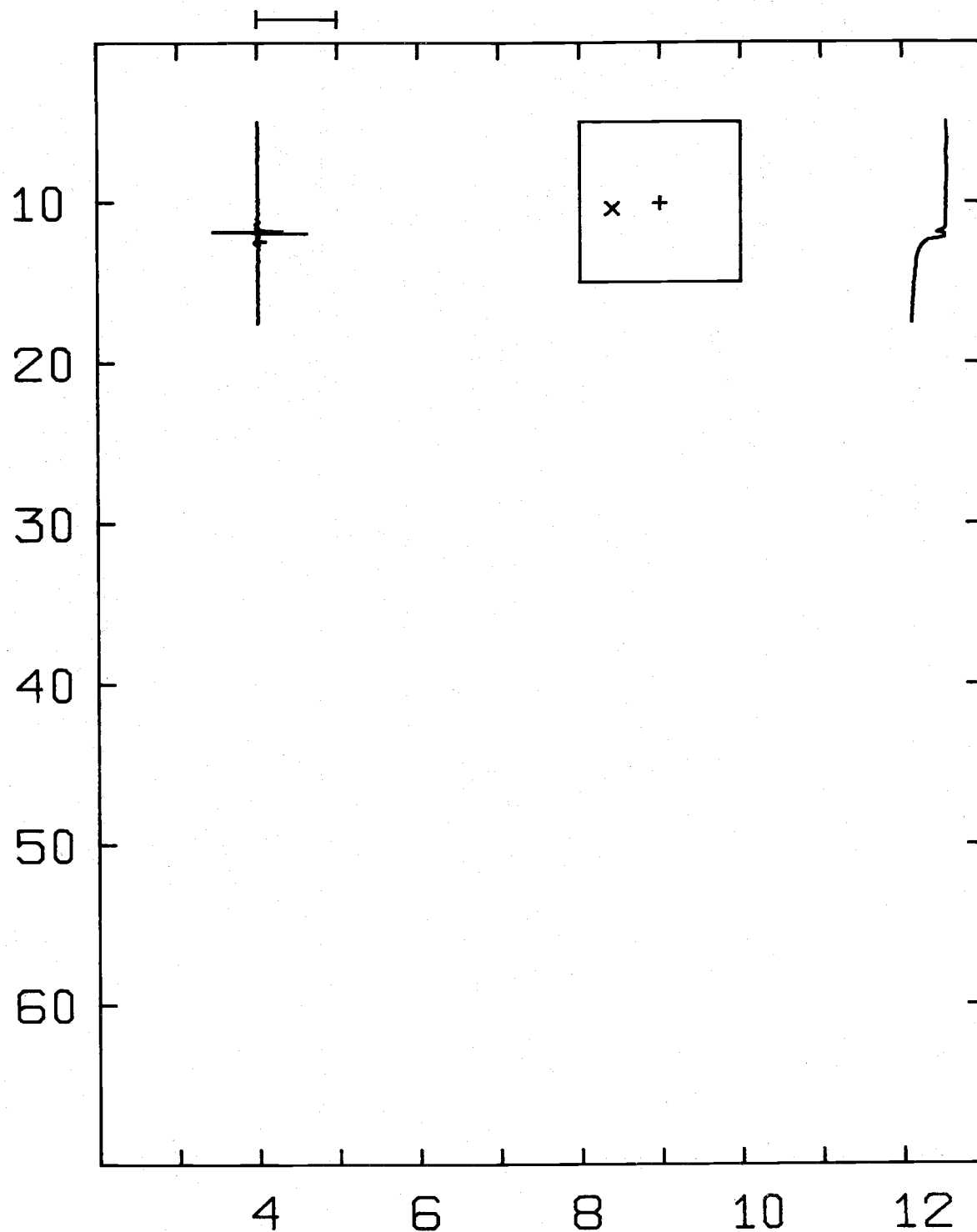
DATE 8/30/77

RANGE 2.98

TIME 0933

BEARING 83

30.0 DEG/M UNIT C P829C4



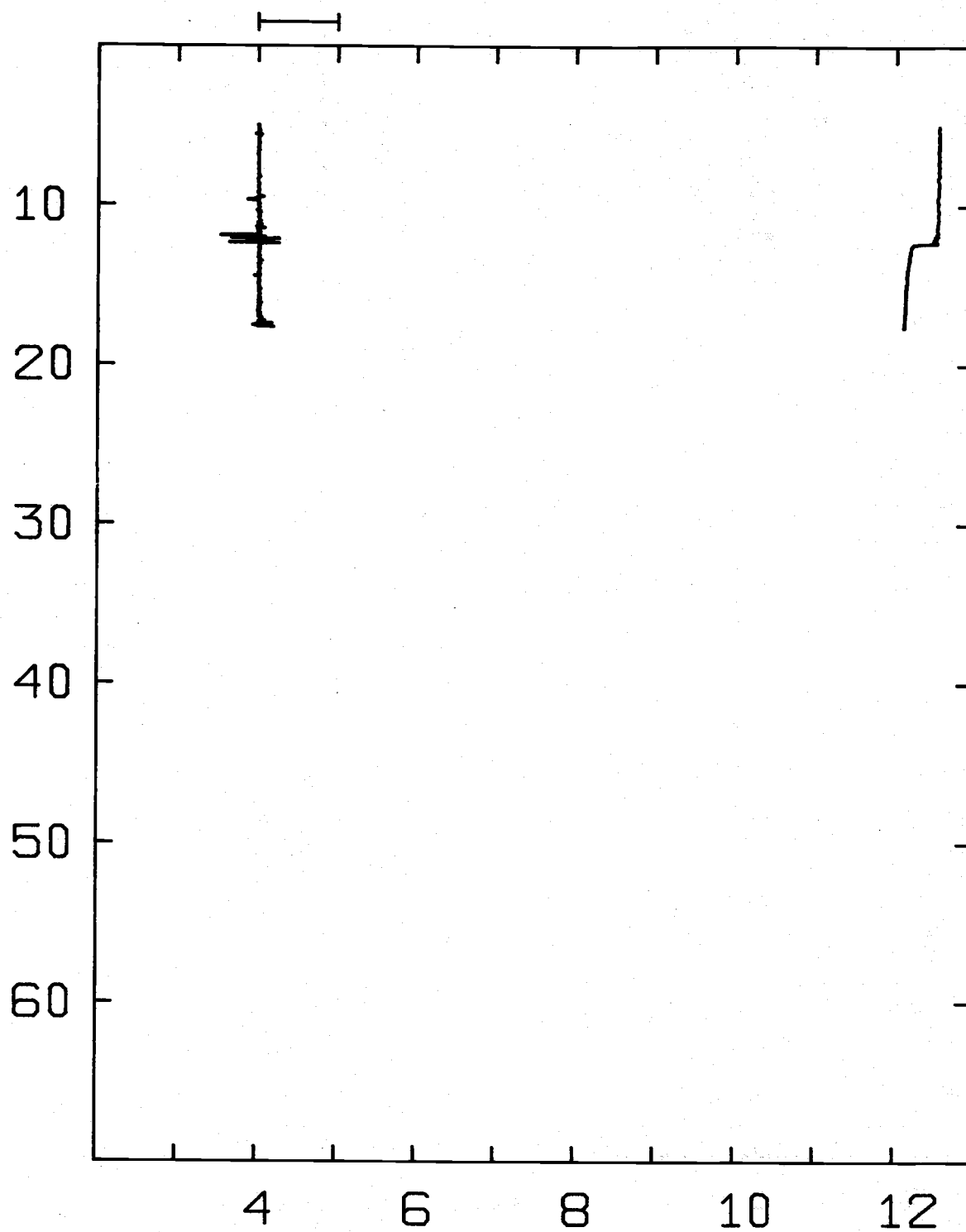
DATE 8/30/77

RANGE 2.98

TIME 0935

BEARING 83

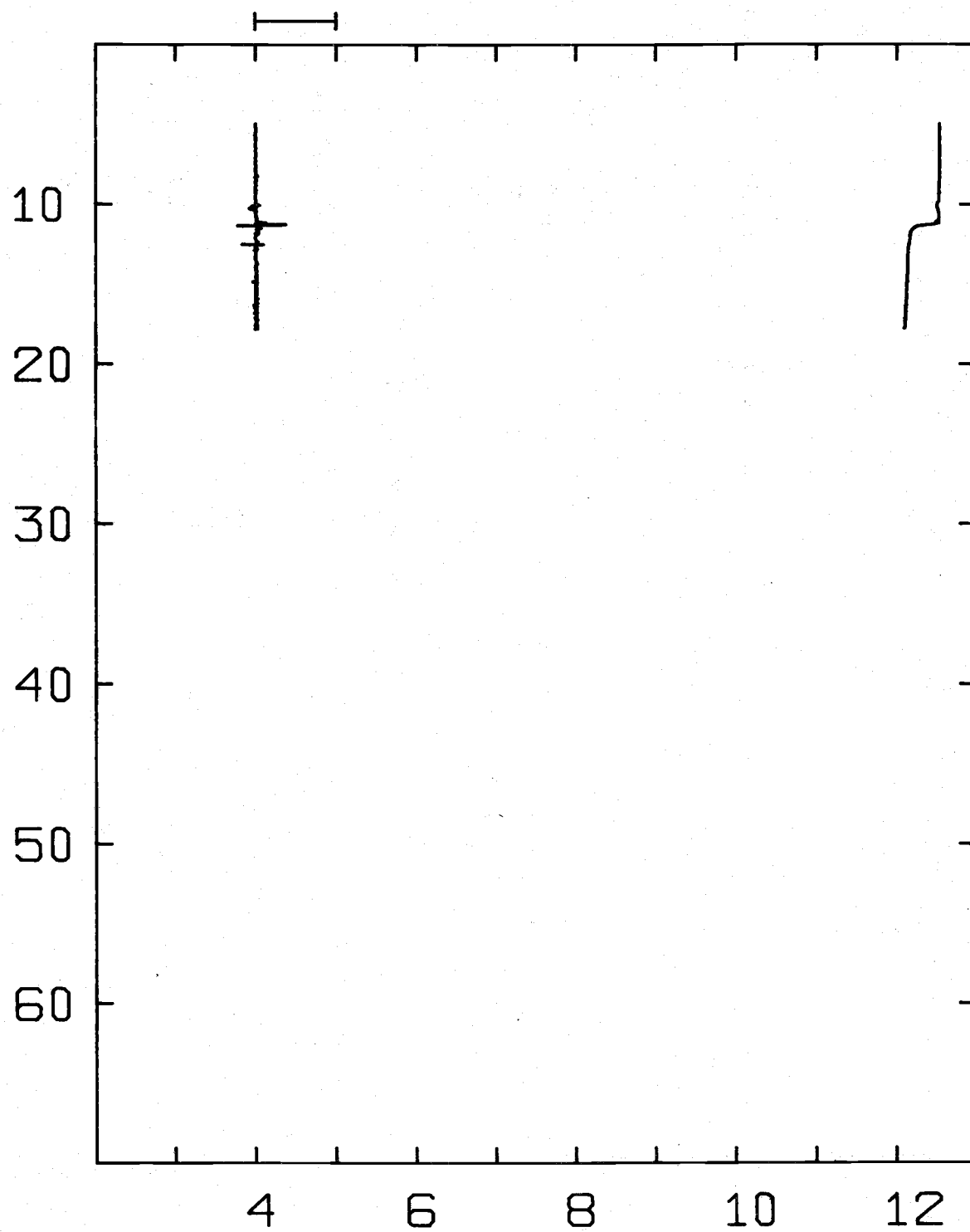
10.0 DEG/M UNIT C P829C5



DATE 8/30/77

TIME 0936

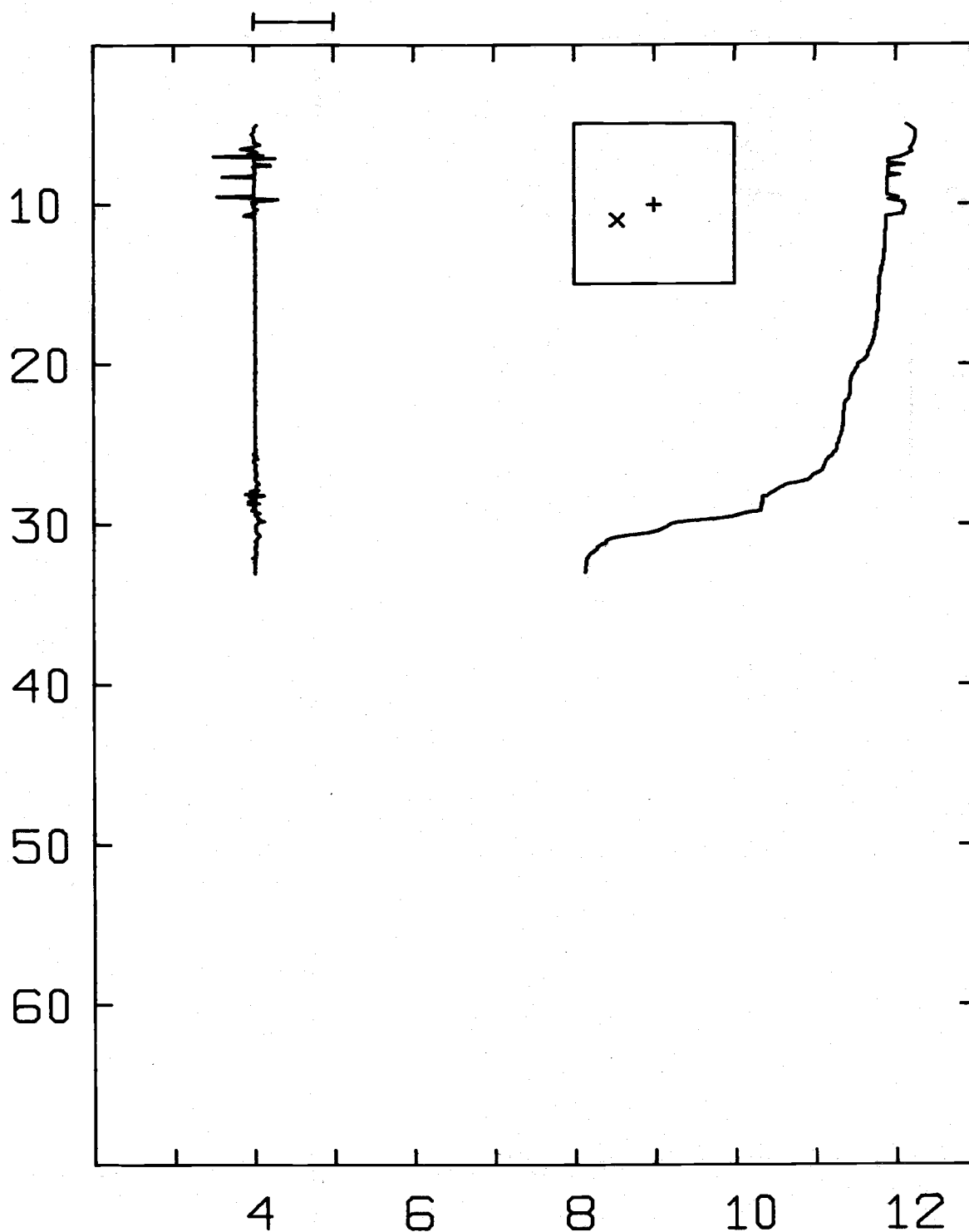
10.0 DEG/M UNIT C P829C6



DATE 8/30/77

TIME 0938

30.0 DEG/M UNIT A P829C10



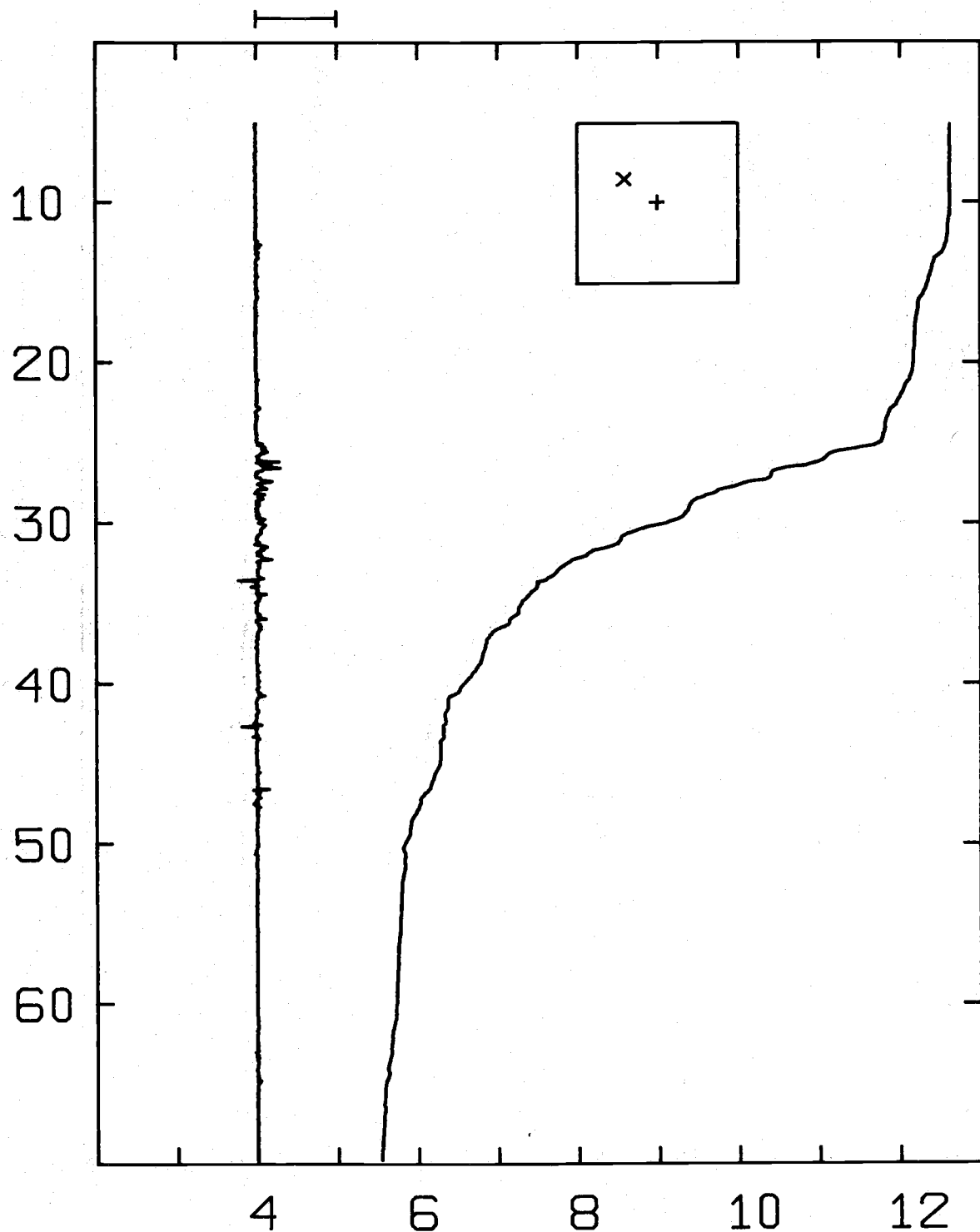
DATE 8/30/77

RANGE 2.52

TIME 1025

BEARING 67

10.0 DEG/M UNIT C P830A2



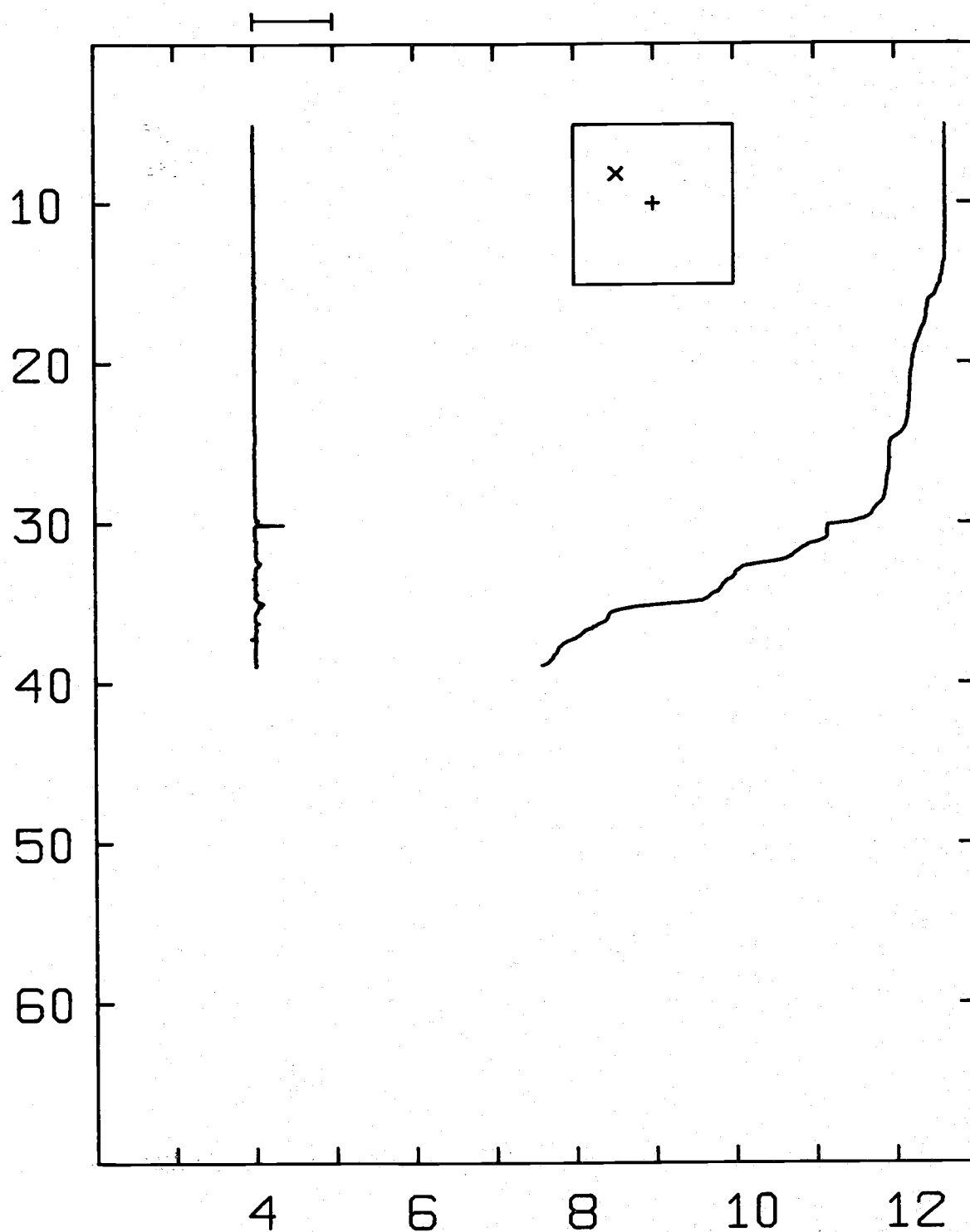
DATE 8/31/77

RANGE 2.52

TIME 0614

BEARING 125

30.0 DEG/M UNIT C P830A3



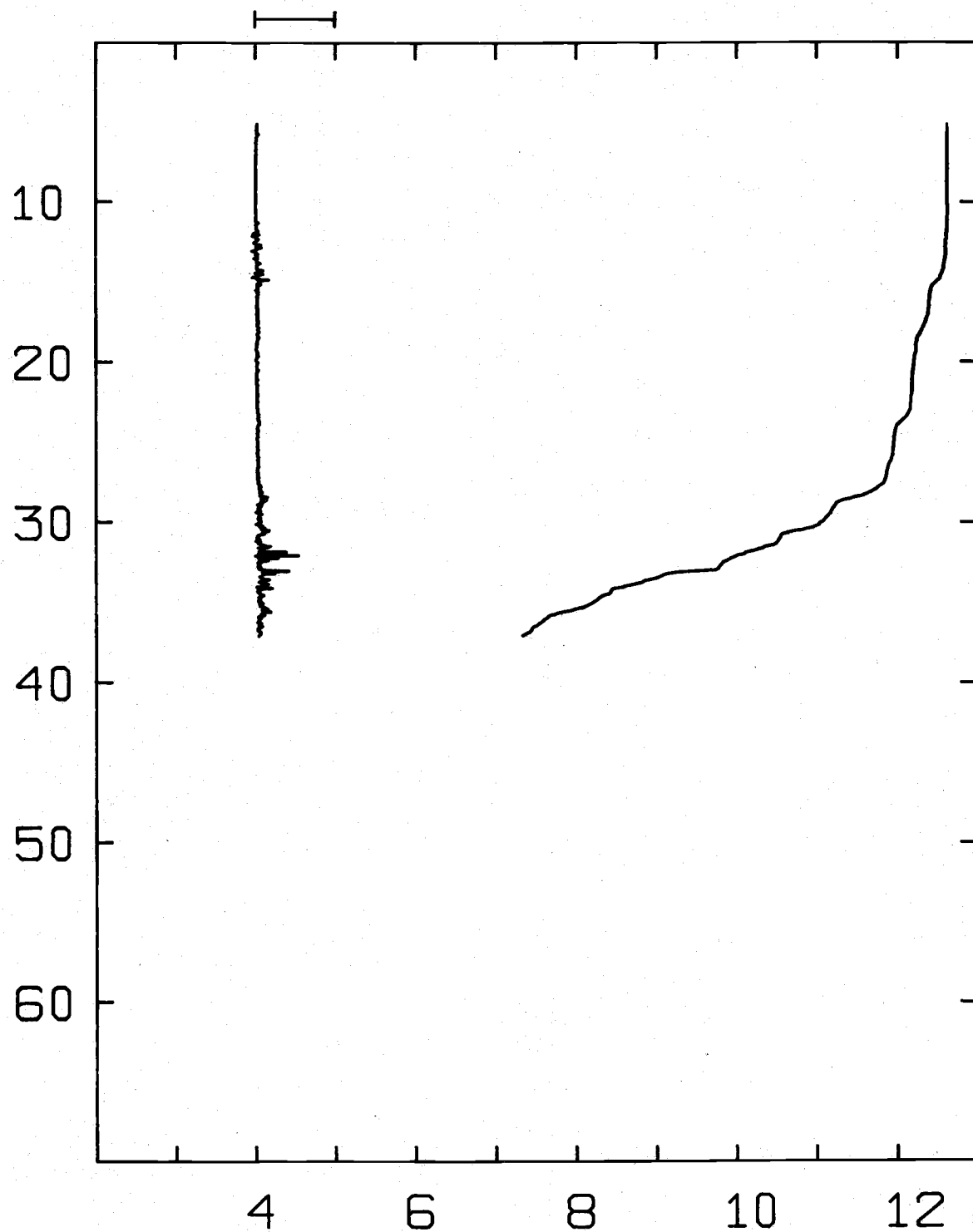
DATE 8/31/77

RANGE 3.00

TIME 0648

BEARING 129

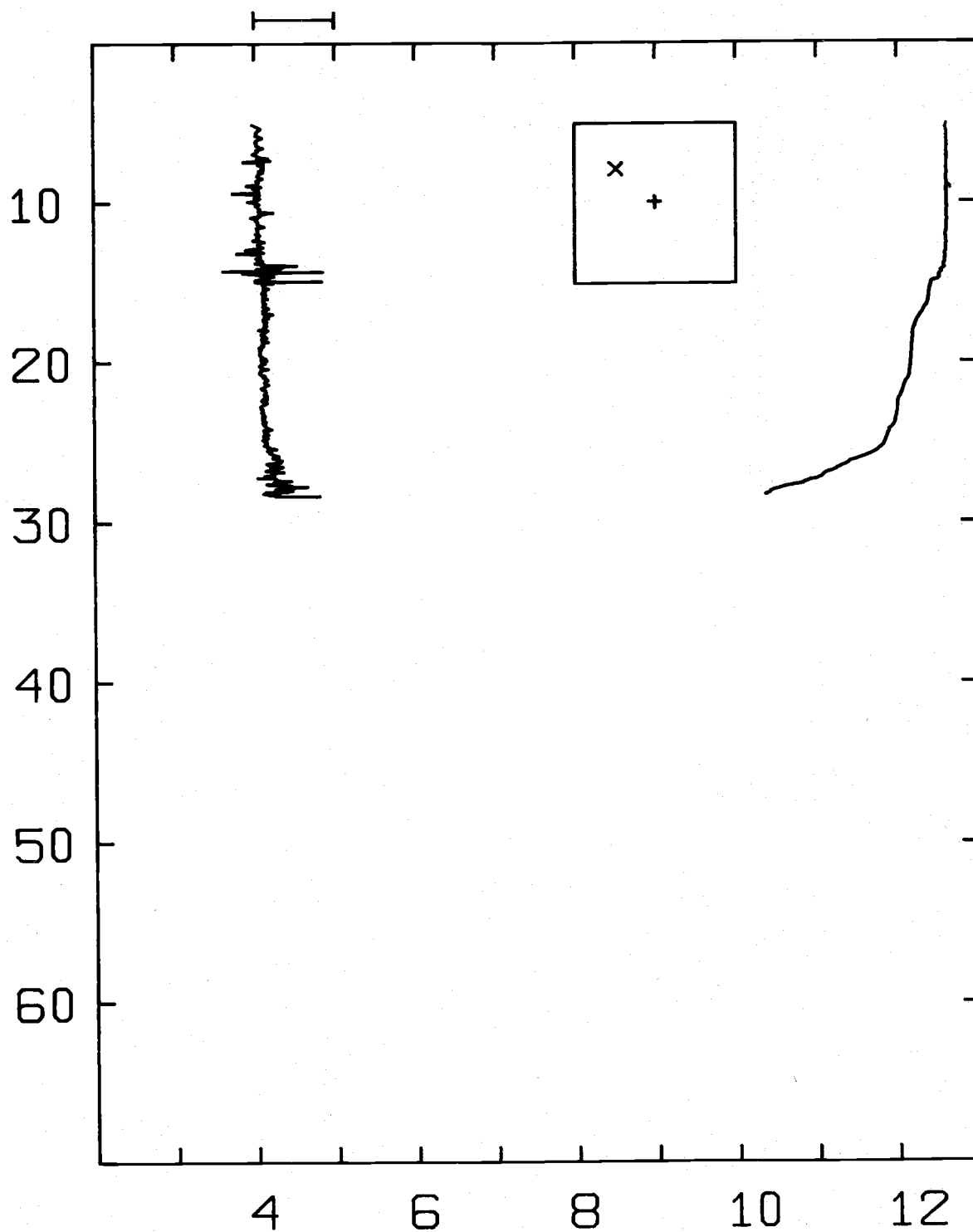
10.0 DEG/M UNIT C P830A4



DATE 8/31/77

TIME 0659

3.00 DEG/M UNIT C P830A5



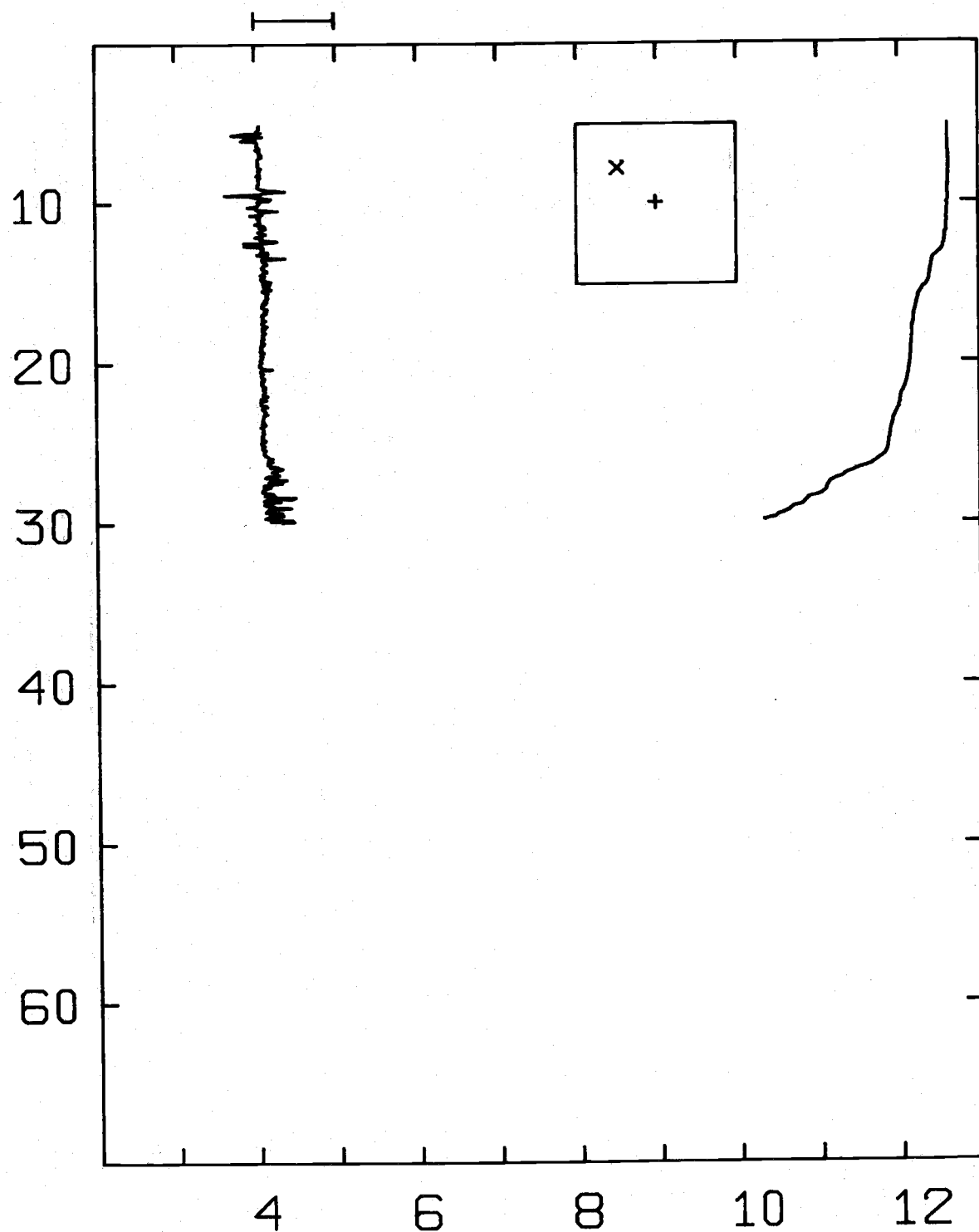
DATE 8/31/77

RANGE 3.22

TIME 0705

BEARING 131

3.00 DEG/M UNIT C P830B1



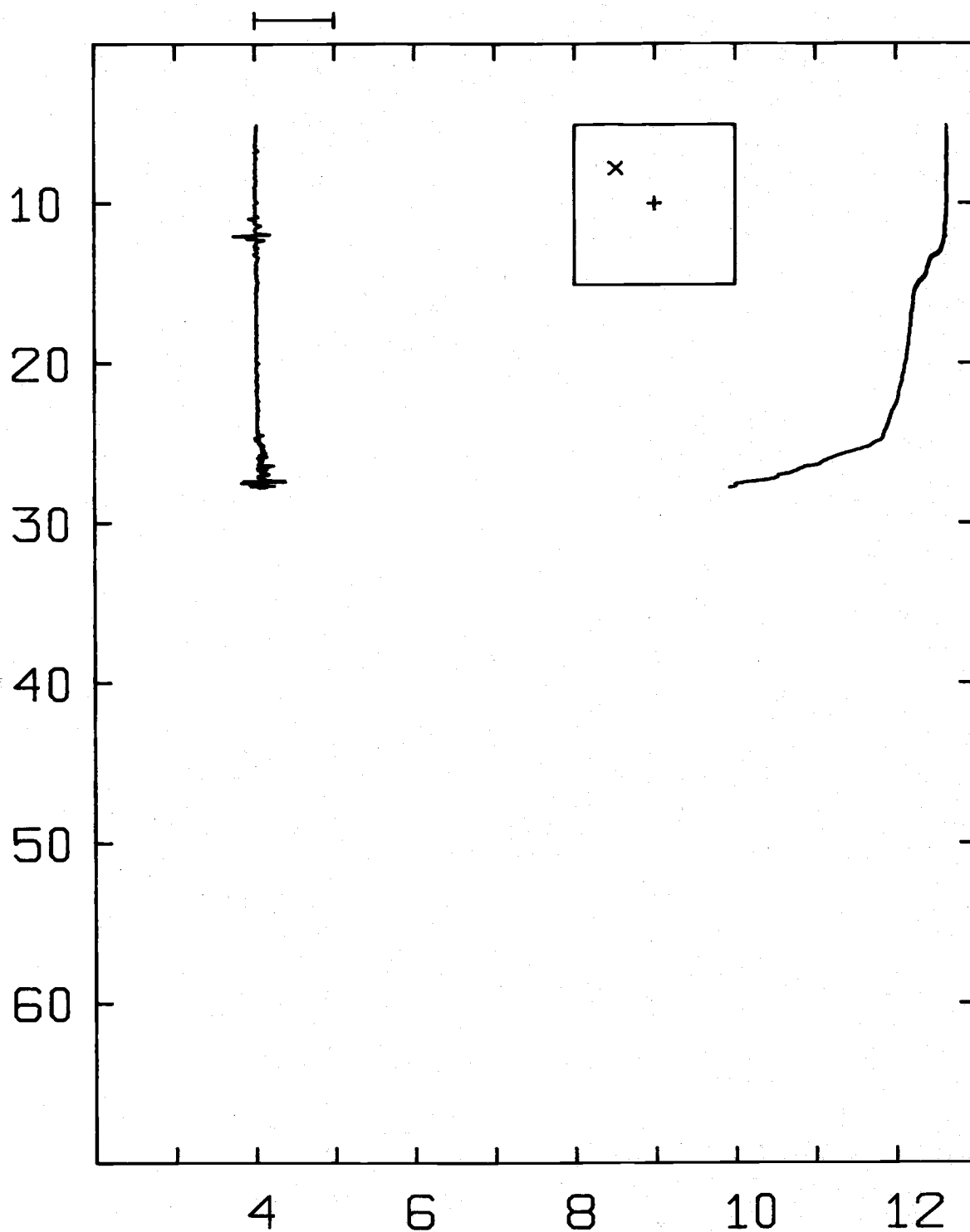
DATE 8/31/77

RANGE 3.26

TIME 0714

BEARING 132

10.0 DEG/M UNIT C P830B2



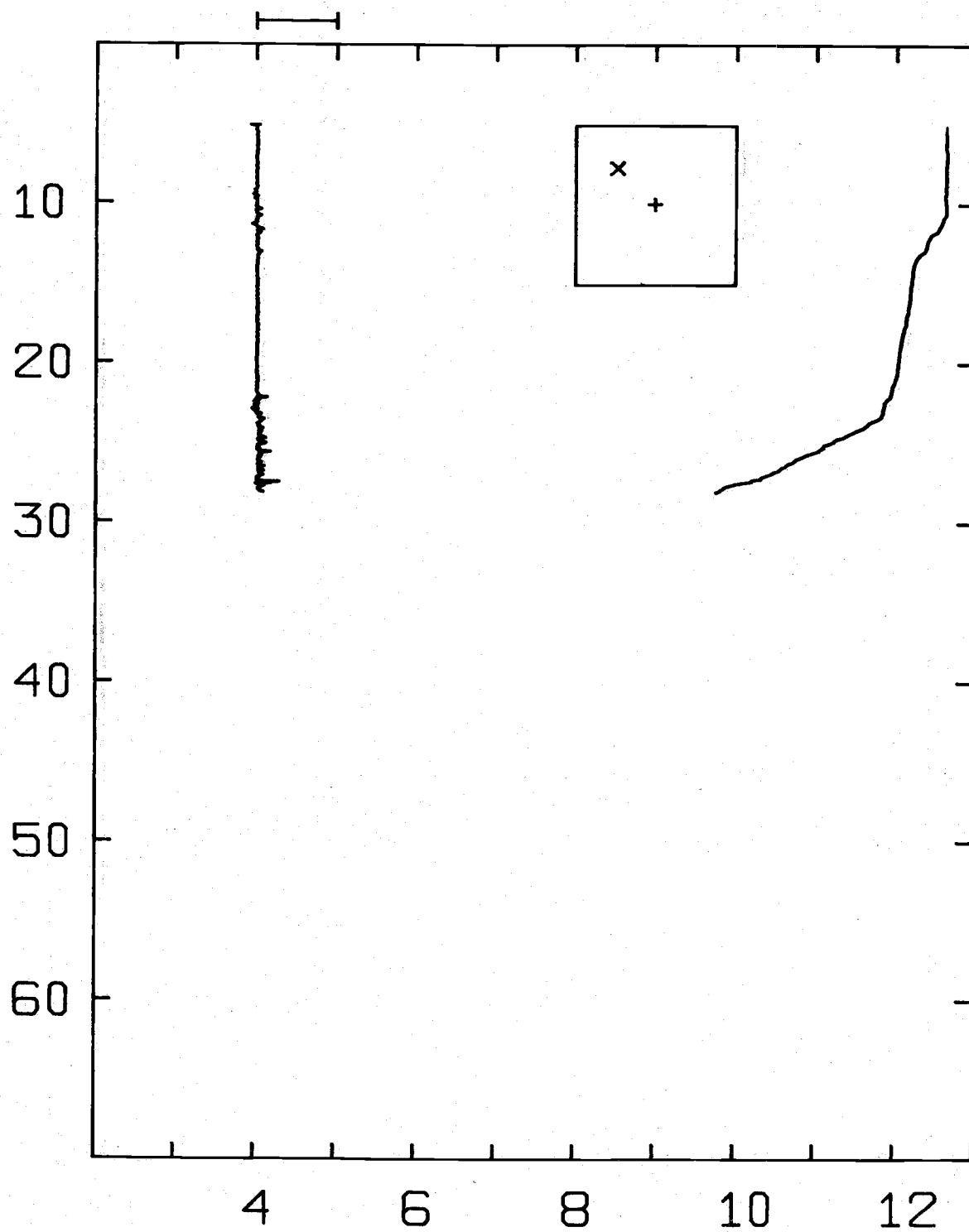
DATE 8/31/77

RANGE 3.32

TIME 0720

BEARING 133

10.0 DEG/M UNIT C P830B3



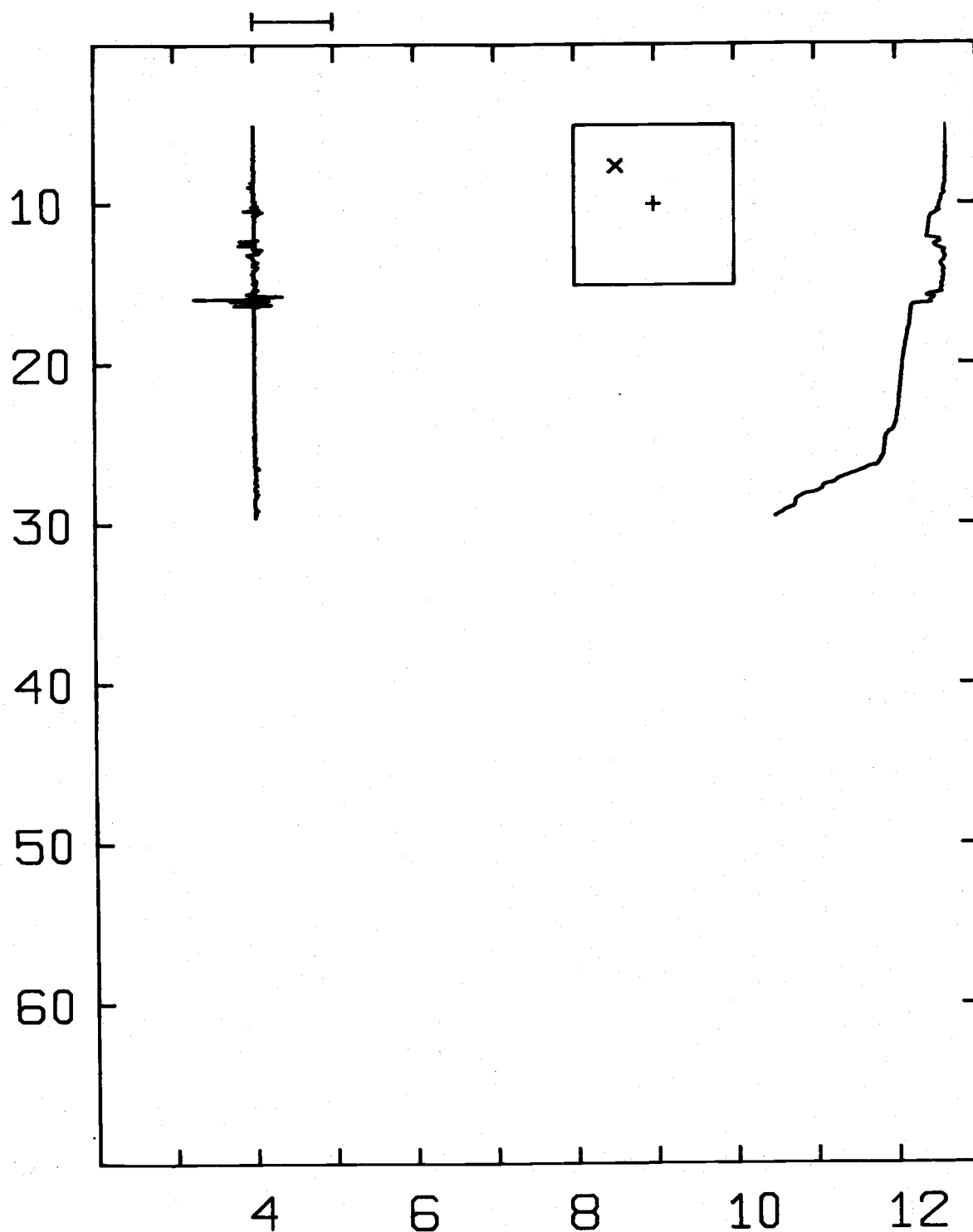
DATE 8/31/77

RANGE 3.34

TIME 0724

BEARING 134

30.0 DEG/M UNIT C P830B4



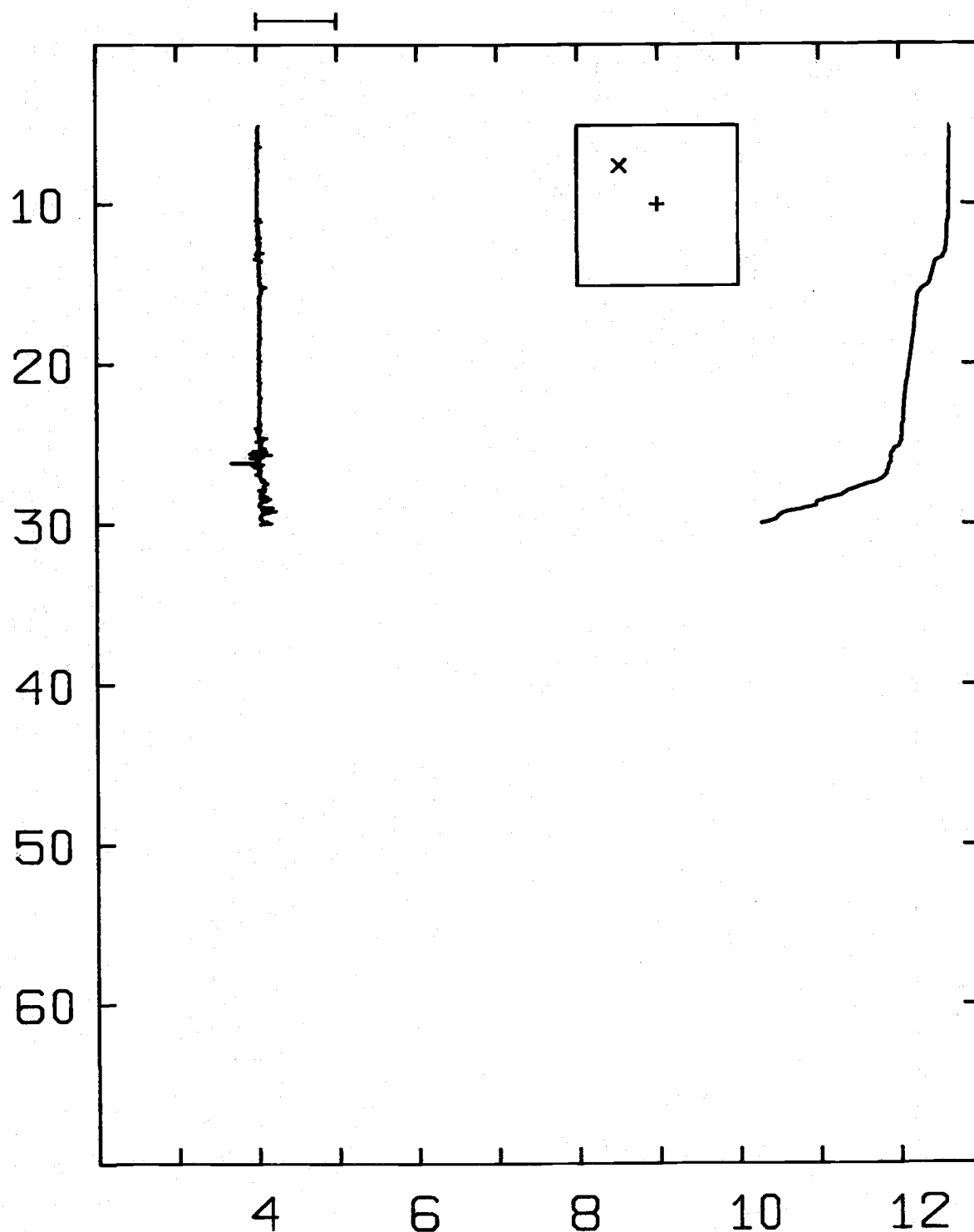
DATE 8/31/77

RANGE 3.37

TIME 0728

BEARING 135

10.0 DEG/M UNIT C P830B5



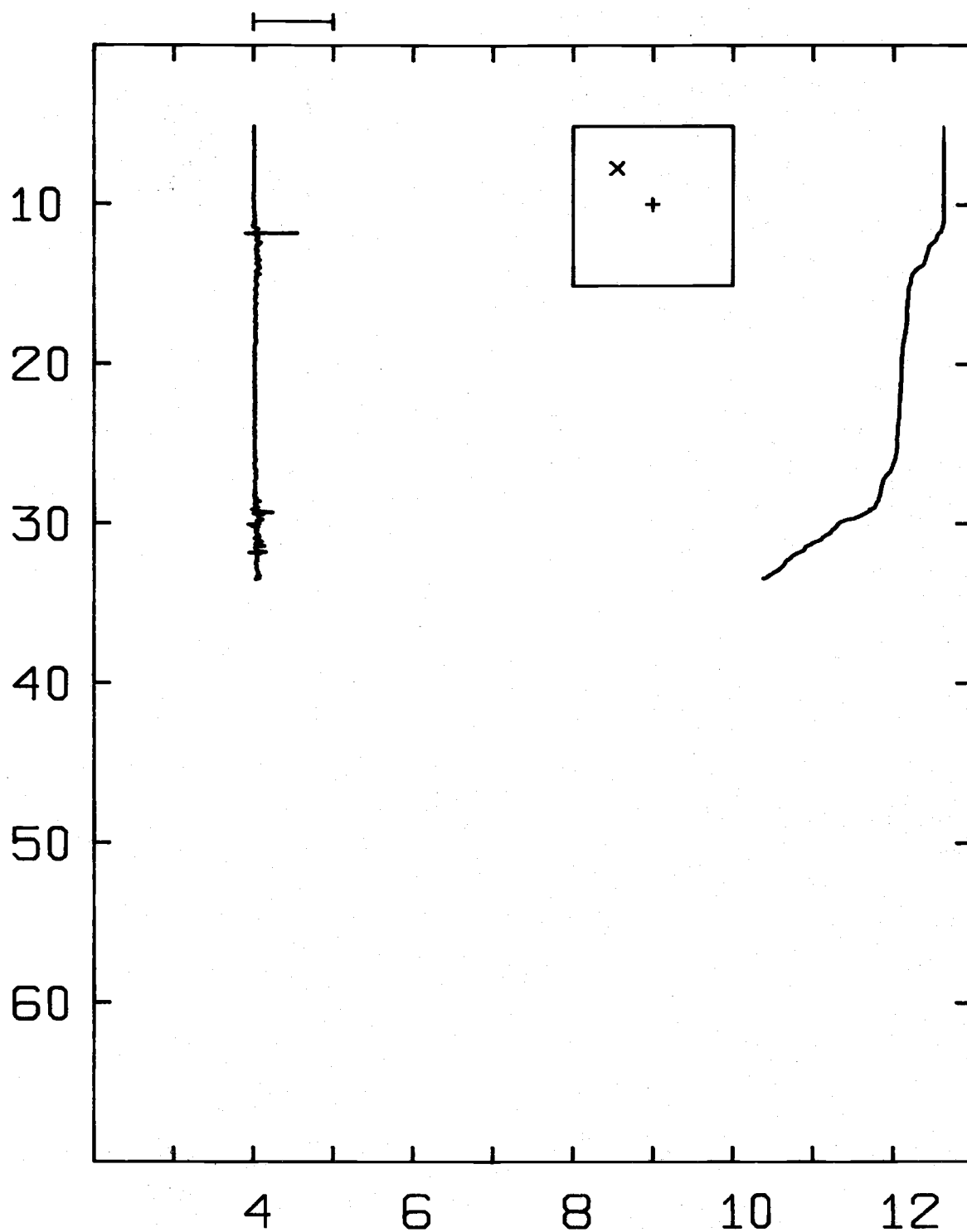
DATE 8/31/77

RANGE 3.41

TIME 0732

BEARING 136

10.0 DEG/M UNIT C P830B6



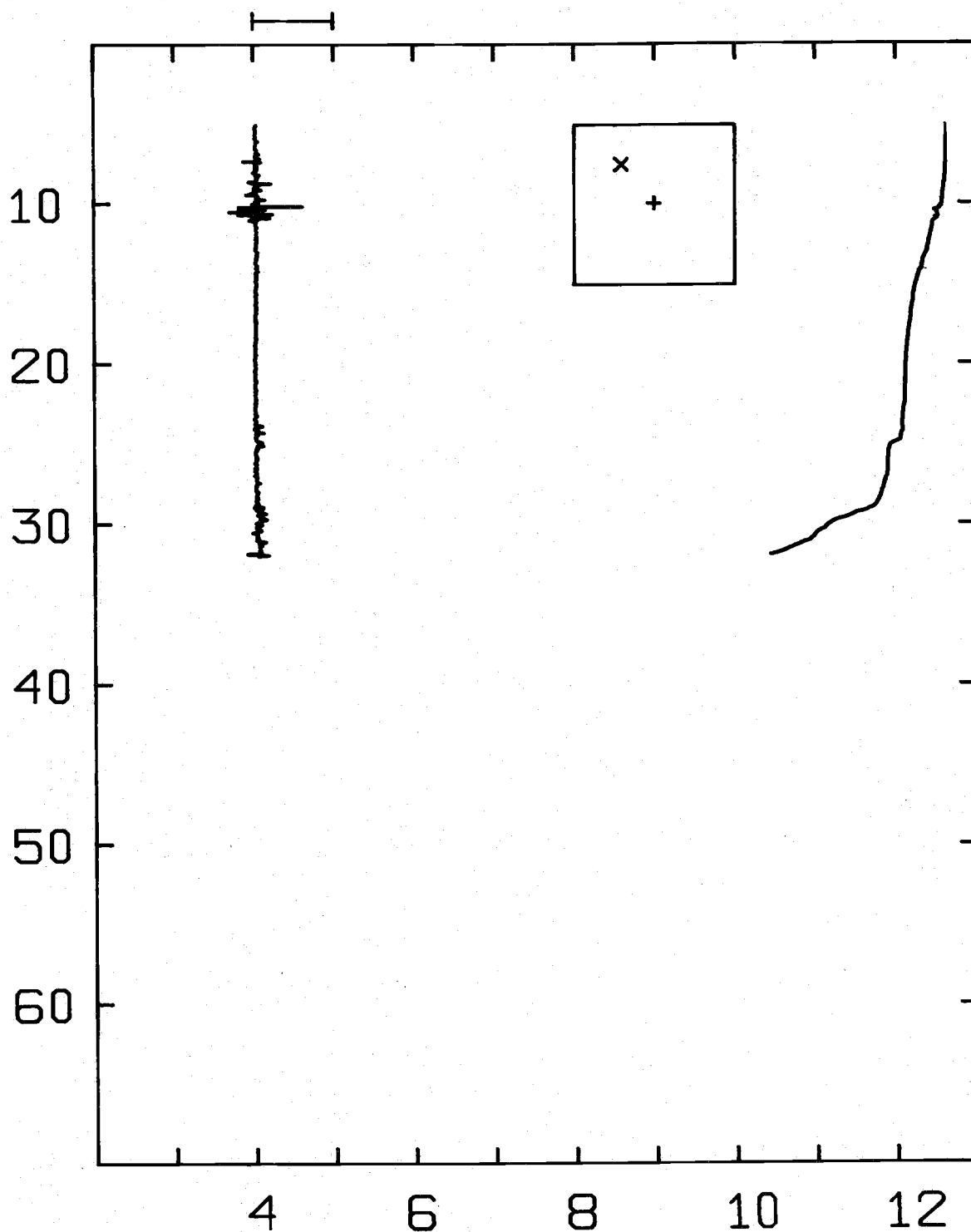
DATE 8/31/77

RANGE 3.24

TIME 0745

BEARING 136

10.0 DEG/M UNIT C P830B7



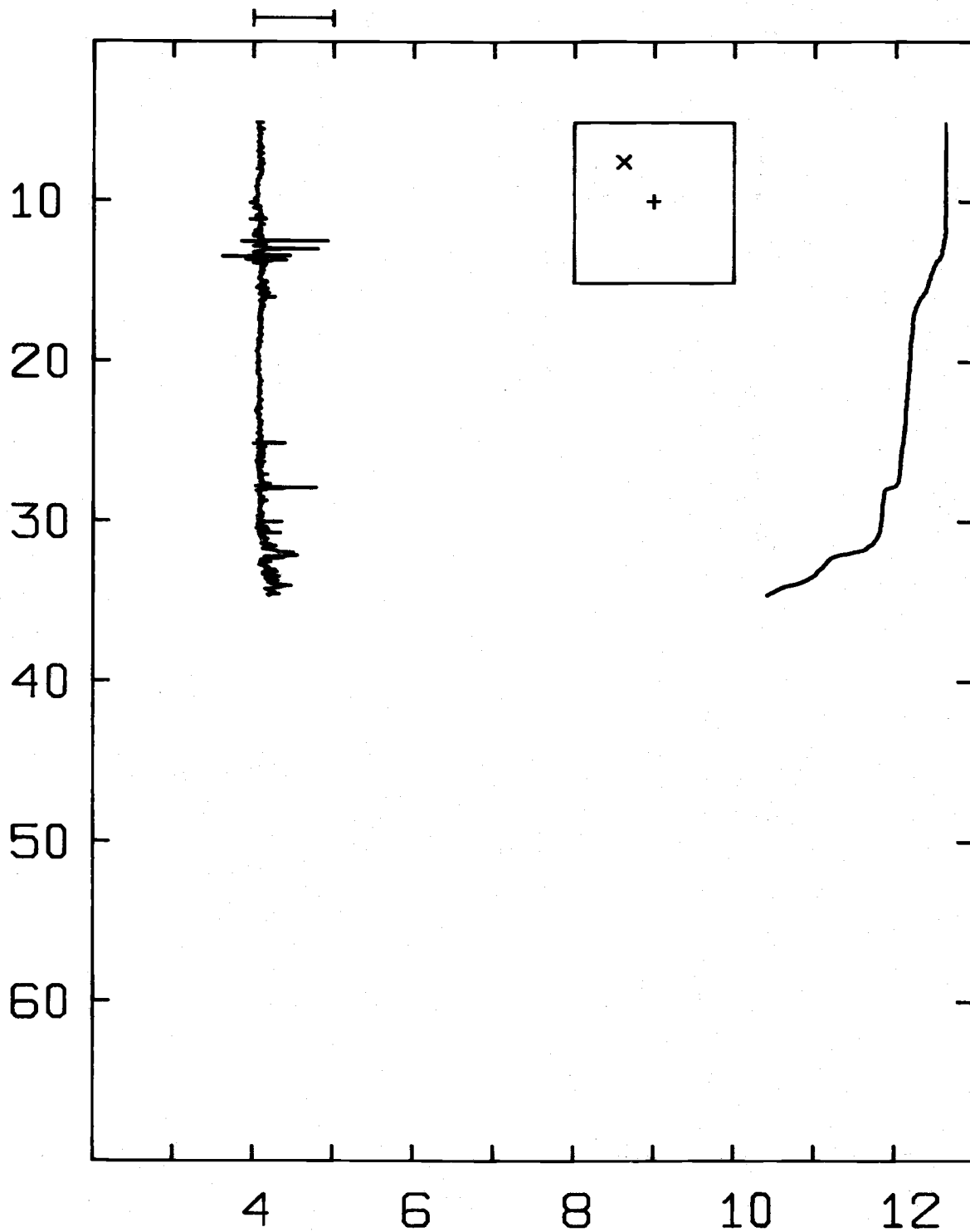
DATE 8/31/77

RANGE 3.22

TIME 0751

BEARING 140

3.00 DEG/M UNIT C P830B8



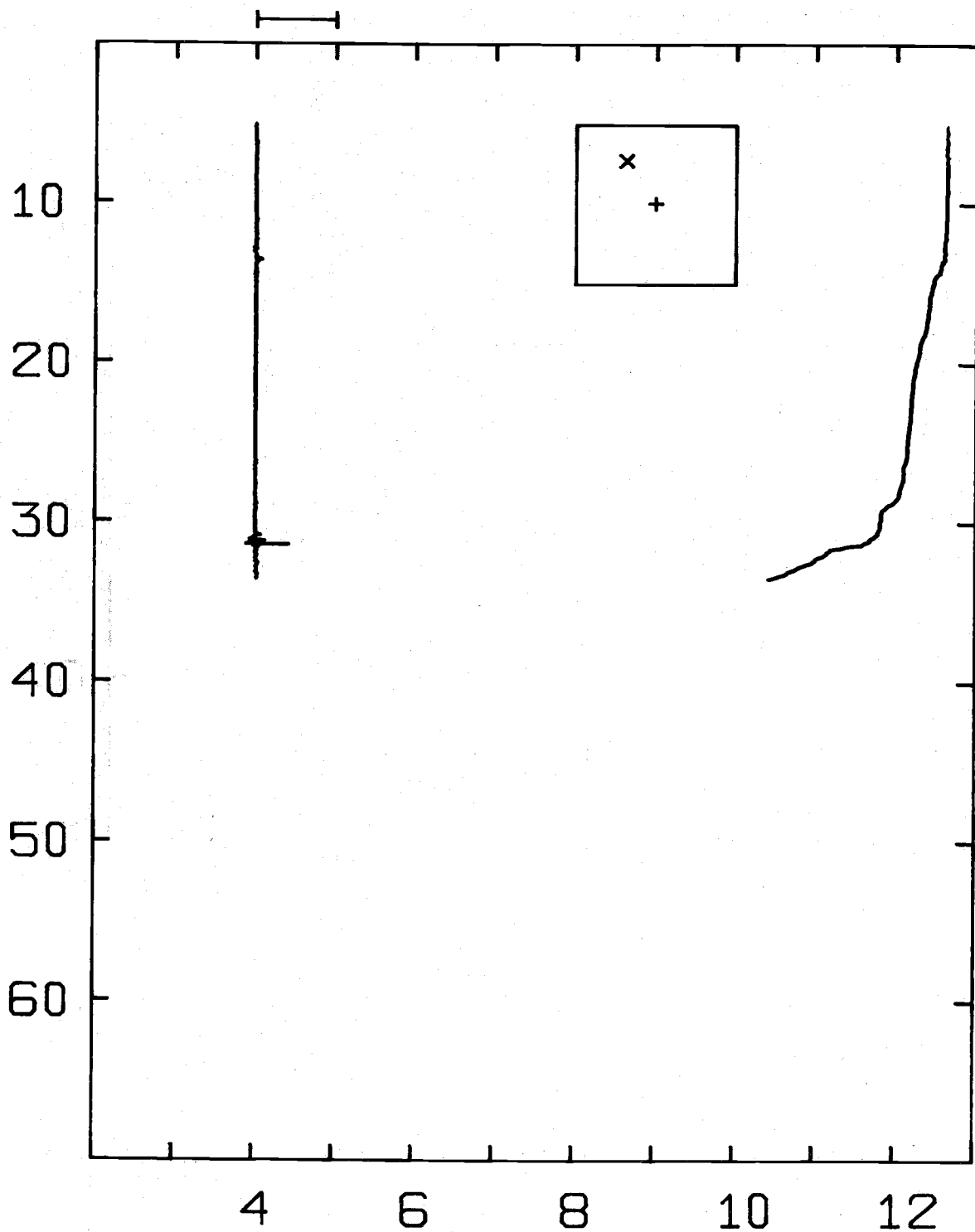
DATE 8/31/77

RANGE 3.19

TIME 0757

BEARING 143

30.0 DEG/M UNIT C P830B9



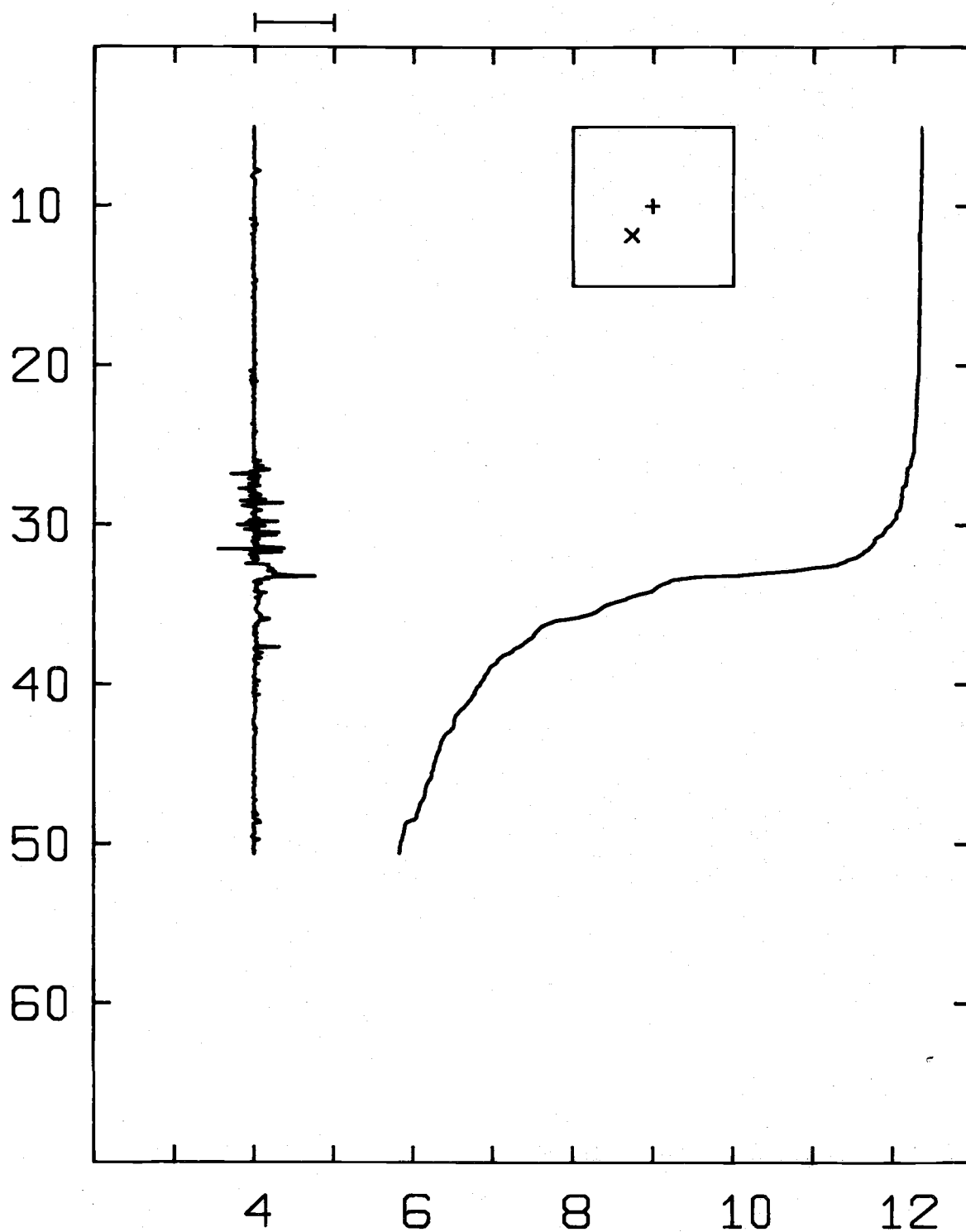
DATE 8/31/77

RANGE 3.32

TIME 0804

BEARING 146

10.0 DEG/M UNIT C P831A1



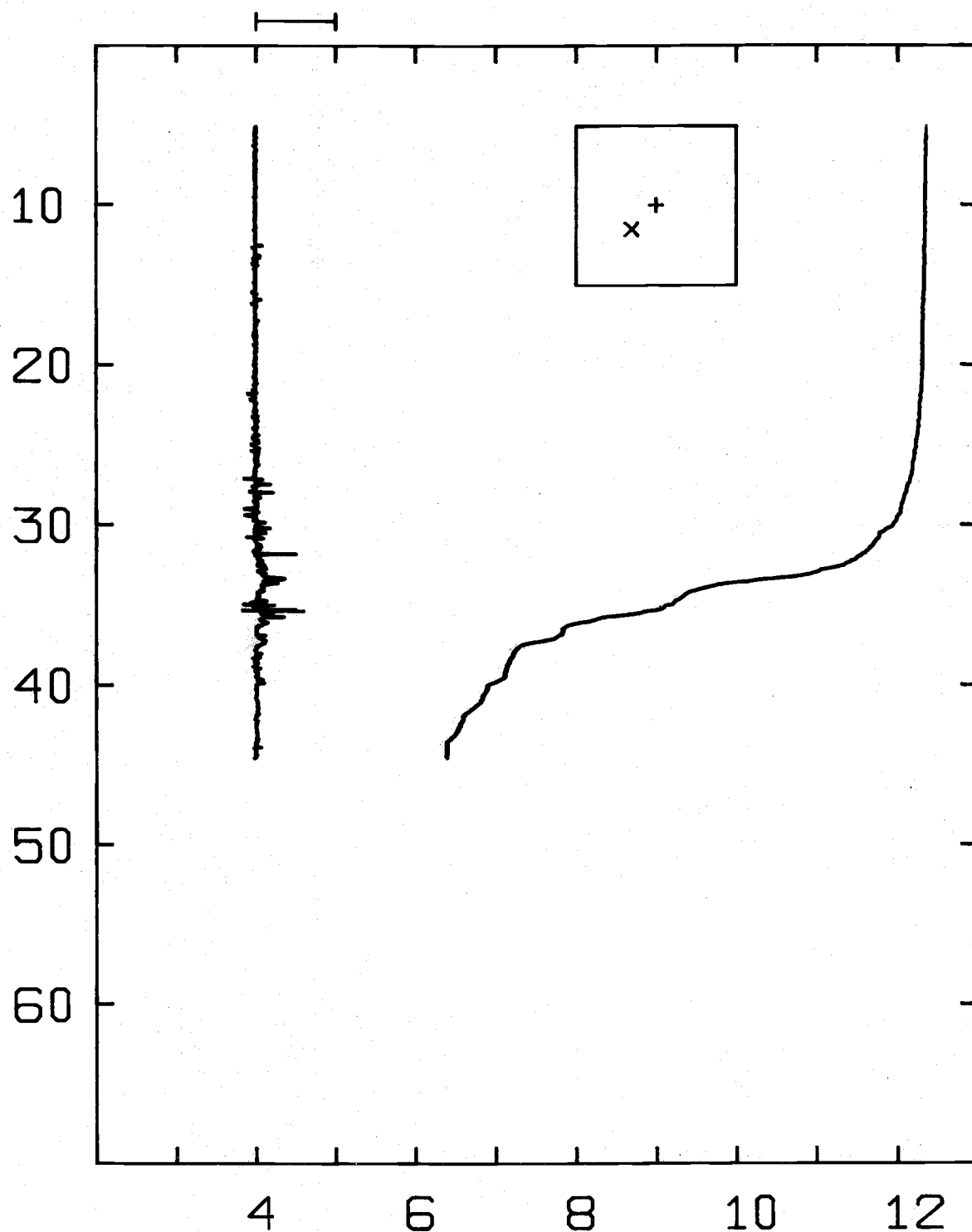
DATE 9/01/77

RANGE 2.22

TIME 0526

BEARING 36

10.0 DEG/M UNIT C P831A2



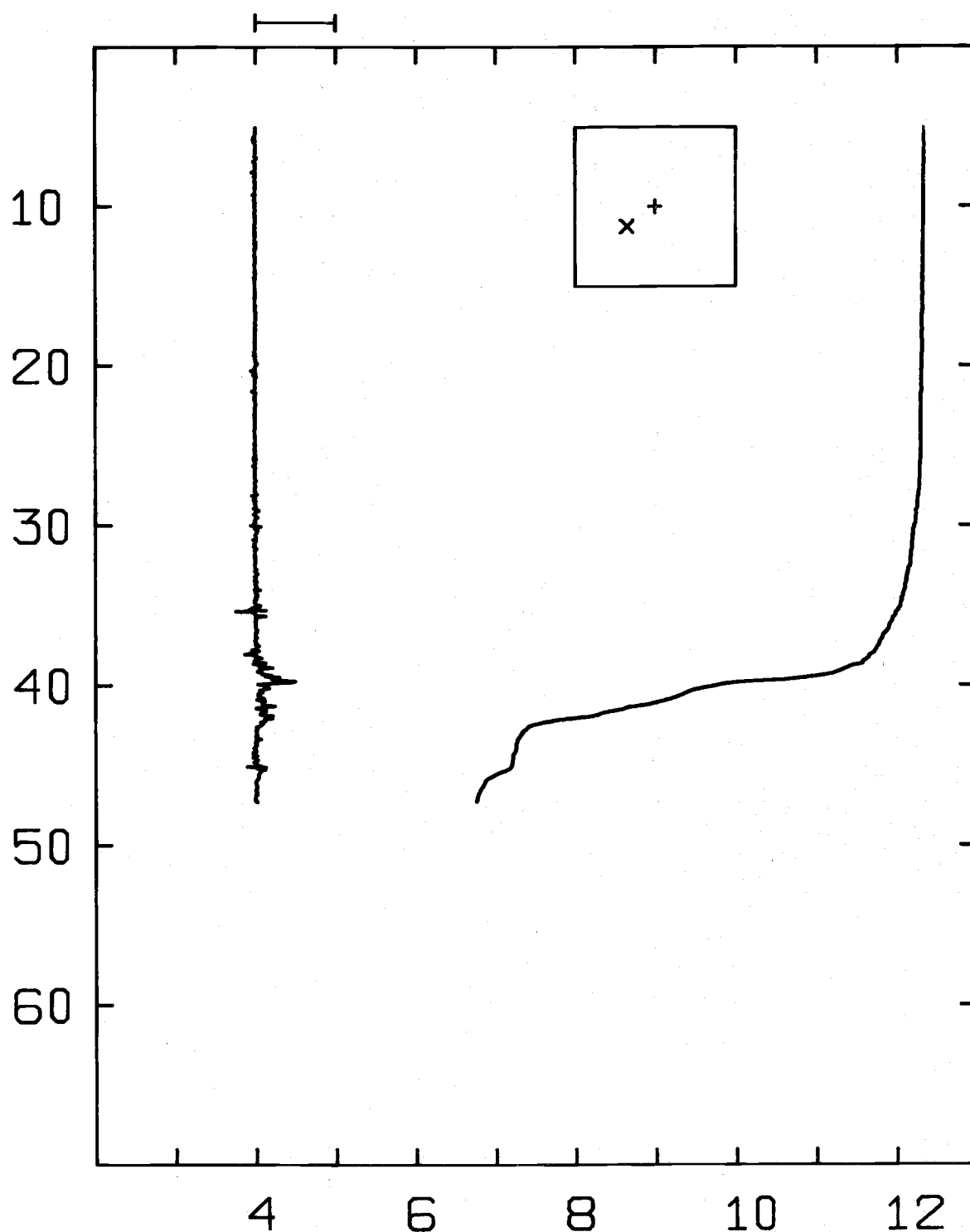
DATE 9/01/77

RANGE 2.15

TIME 0542

BEARING 46

10.0 DEG/M UNIT C P831A3



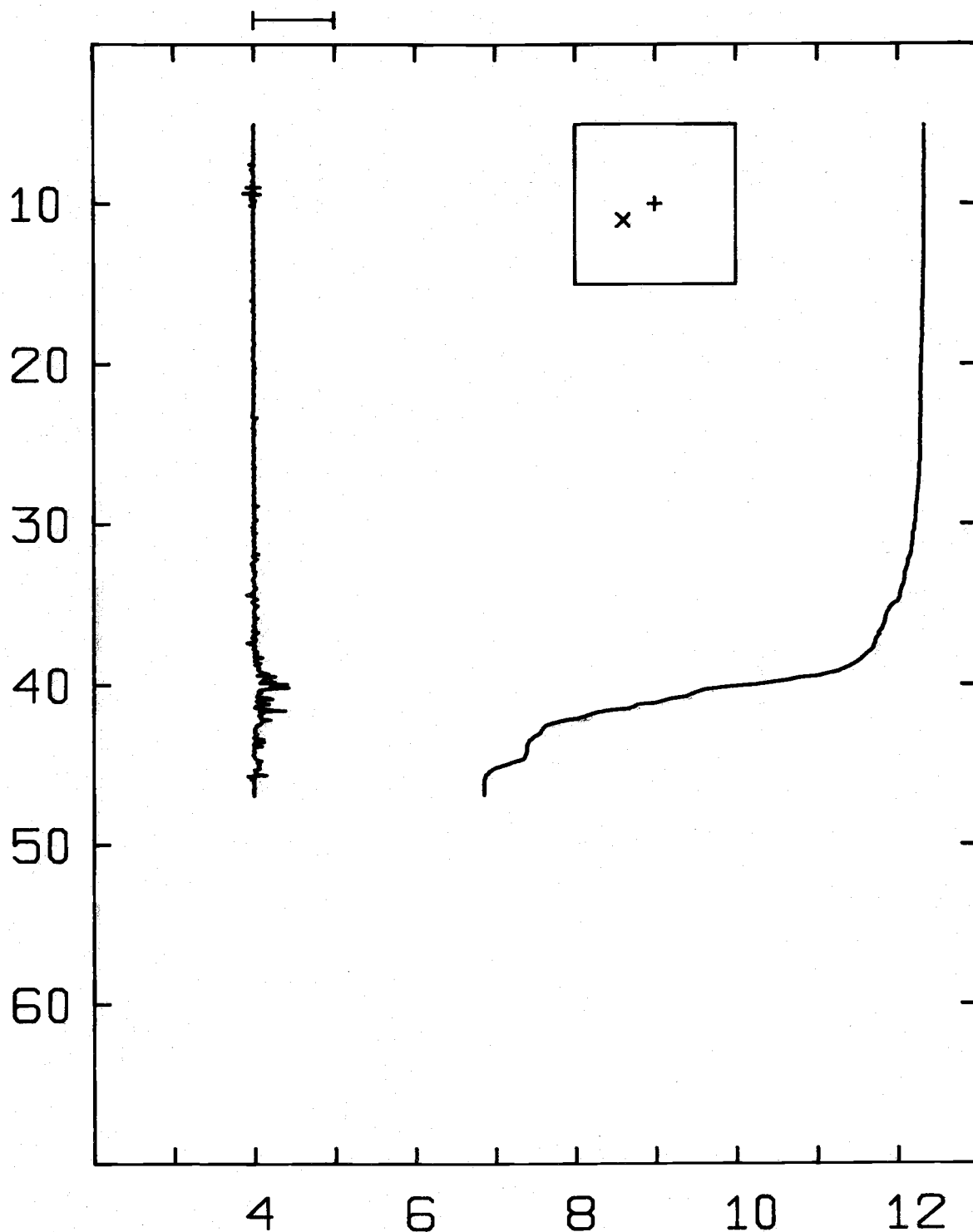
DATE 9/01/77

RANGE 2.15

TIME 0557

BEARING 55

10.0 DEG/M UNIT C P831A4



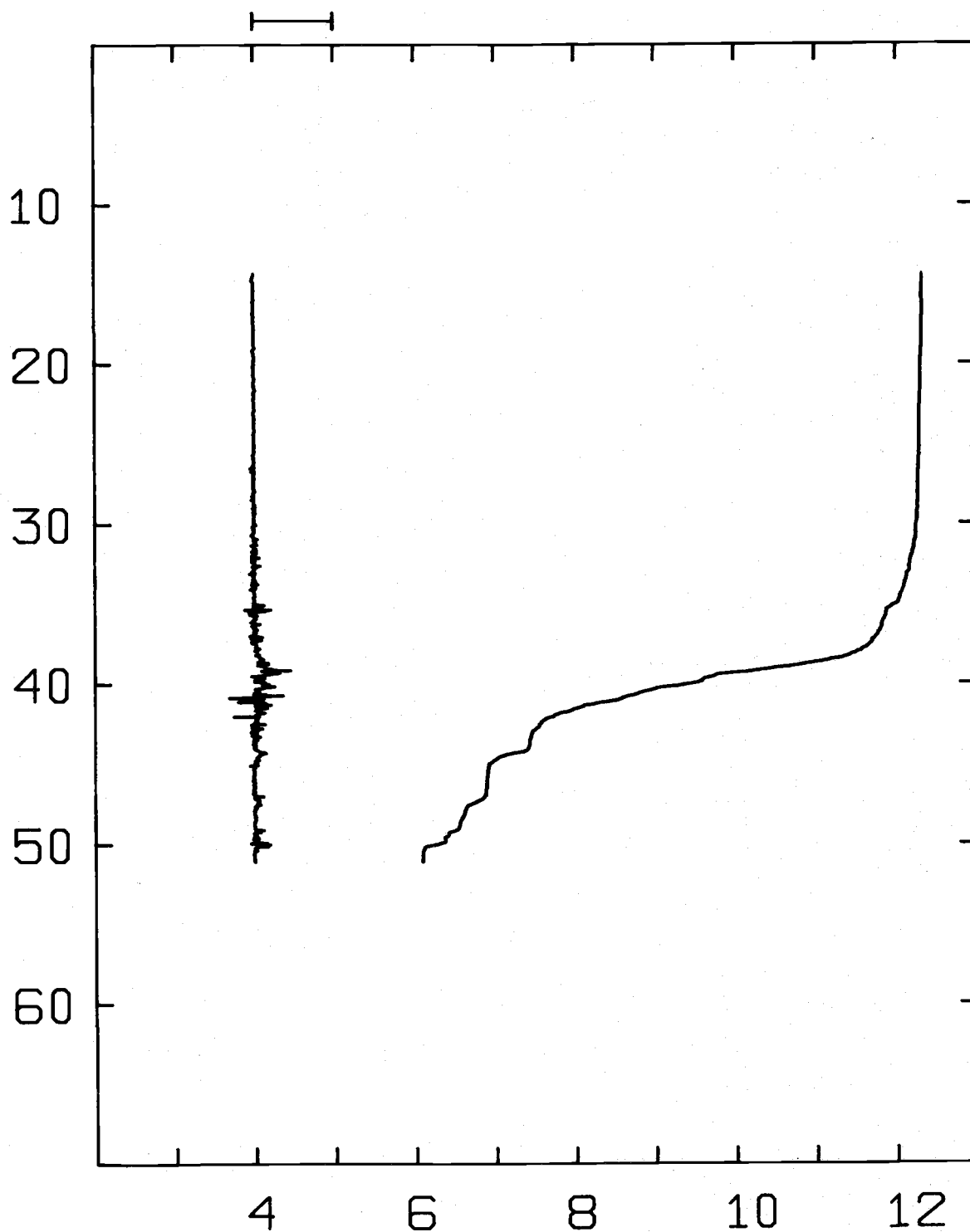
DATE 9/01/77

RANGE 2.24

TIME 0610

BEARING 63

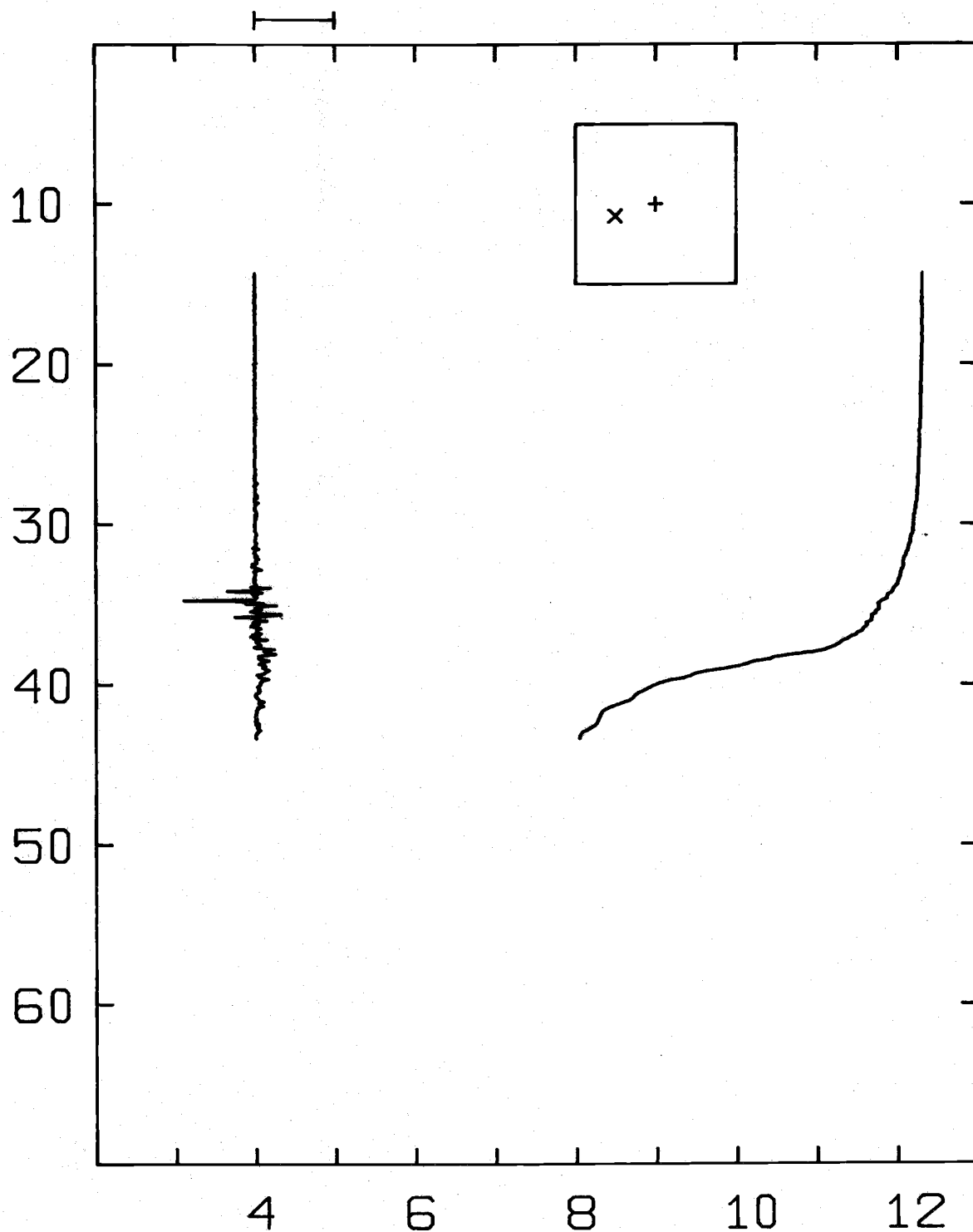
10.0 DEG/M UNIT C P831A5



DATE 9/01/77

TIME 0620

10.0 DEG/M UNIT C P831A6



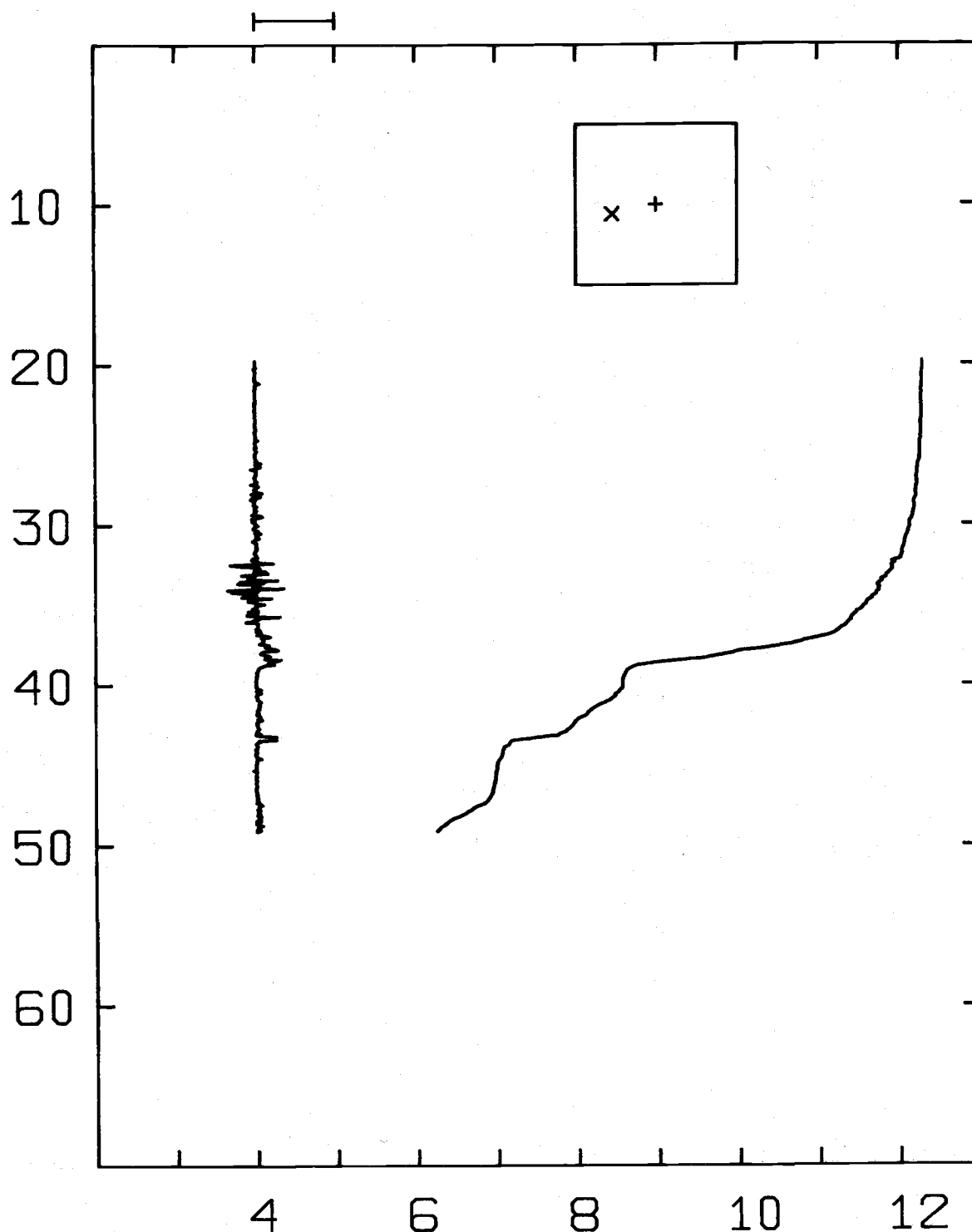
DATE 9/01/77

RANGE 2.63

TIME 0635

BEARING 74

10.0 DEG/M UNIT C P831A7



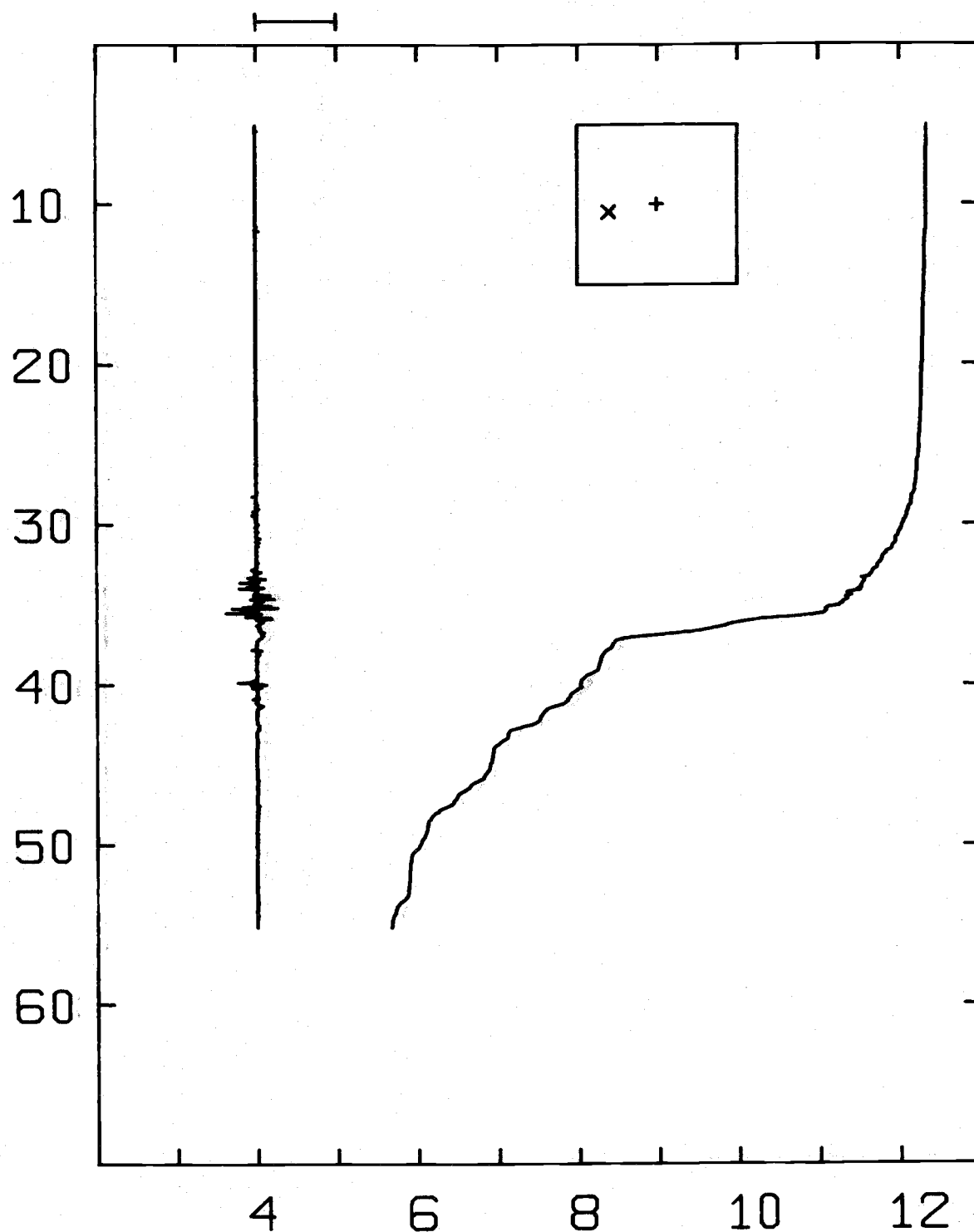
DATE 9/01/77

RANGE 2.80

TIME 0647

BEARING 78

30.0 DEG/M UNIT C P831B1



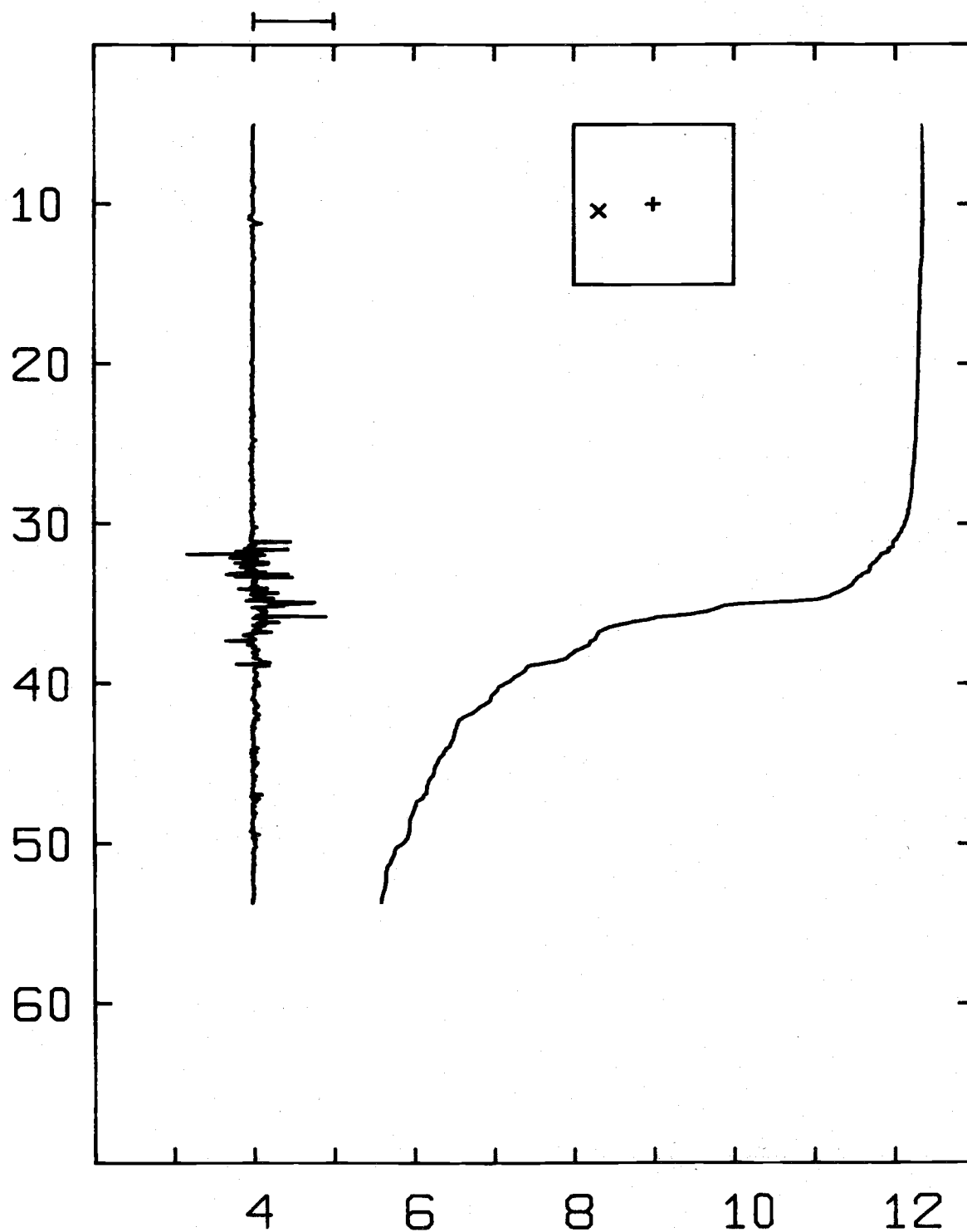
DATE 9/01/77

RANGE 3.08

TIME 0655

BEARING 81

3.00 DEG/M UNIT C P831B2



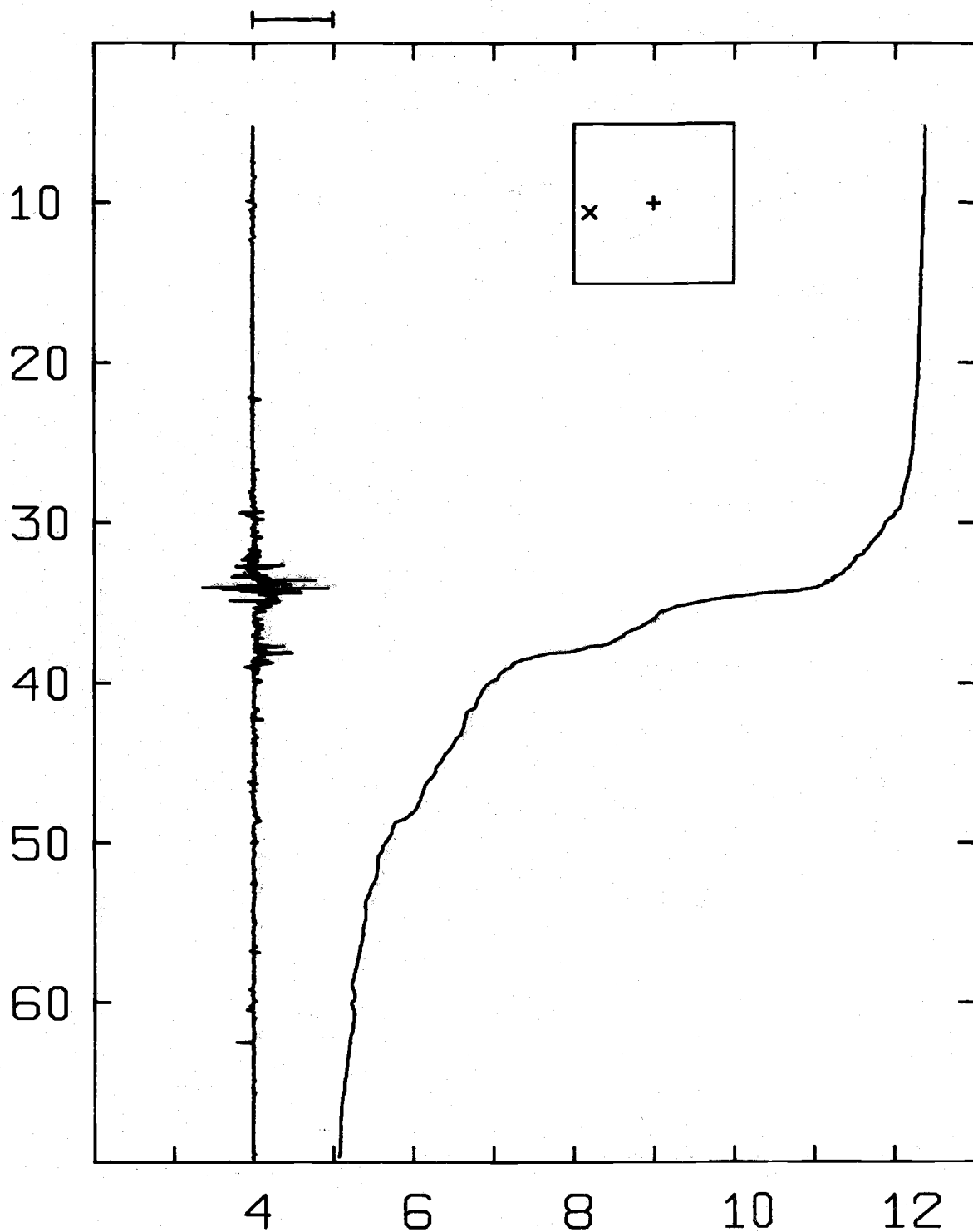
DATE 9/01/77

RANGE 3.47

TIME 0710

BEARING 83

3.00 DEG/M UNIT C P831B3



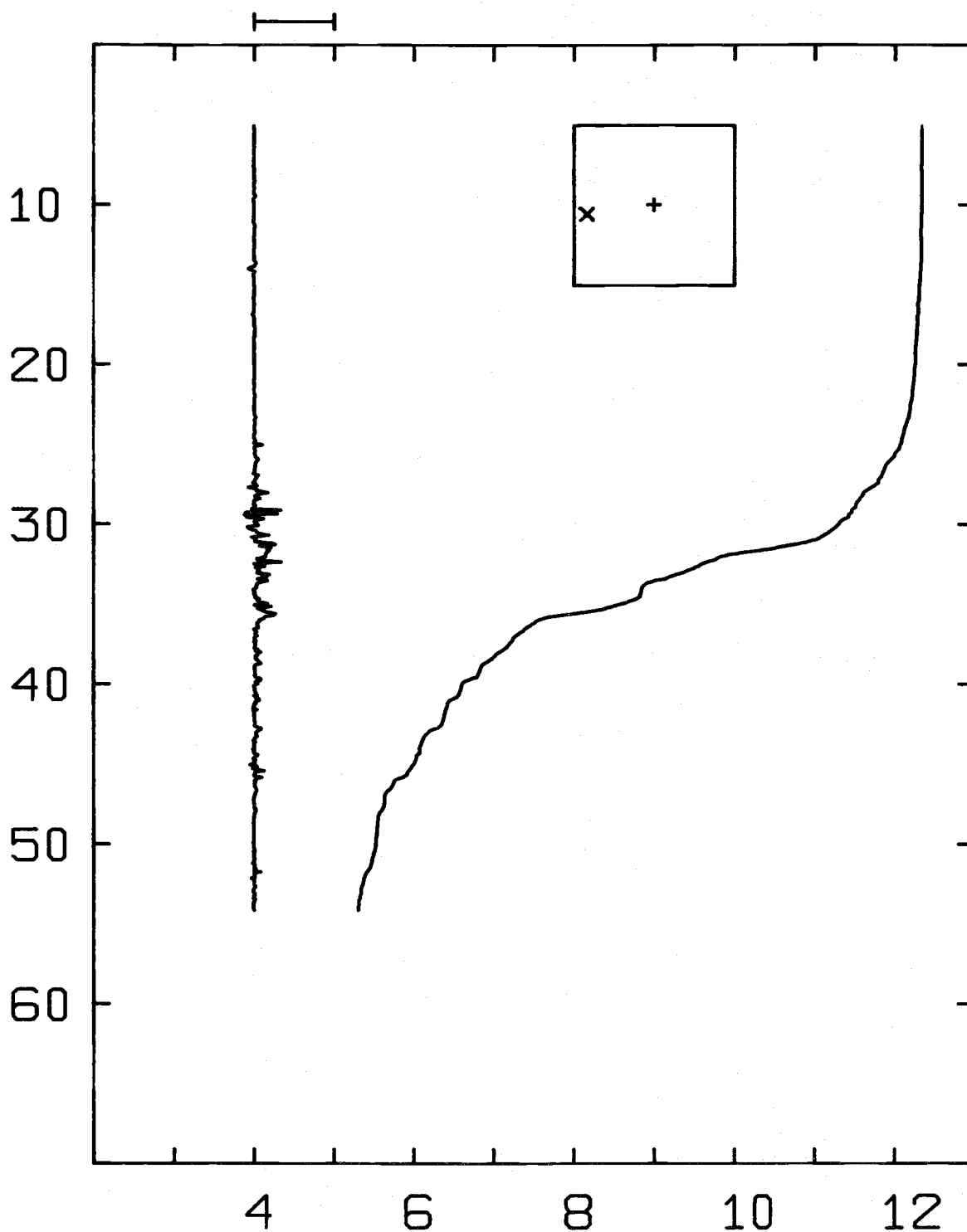
DATE 9/01/77

RANGE 4.04

TIME 0732

BEARING 82

3.00 DEG/M UNIT C P831B4



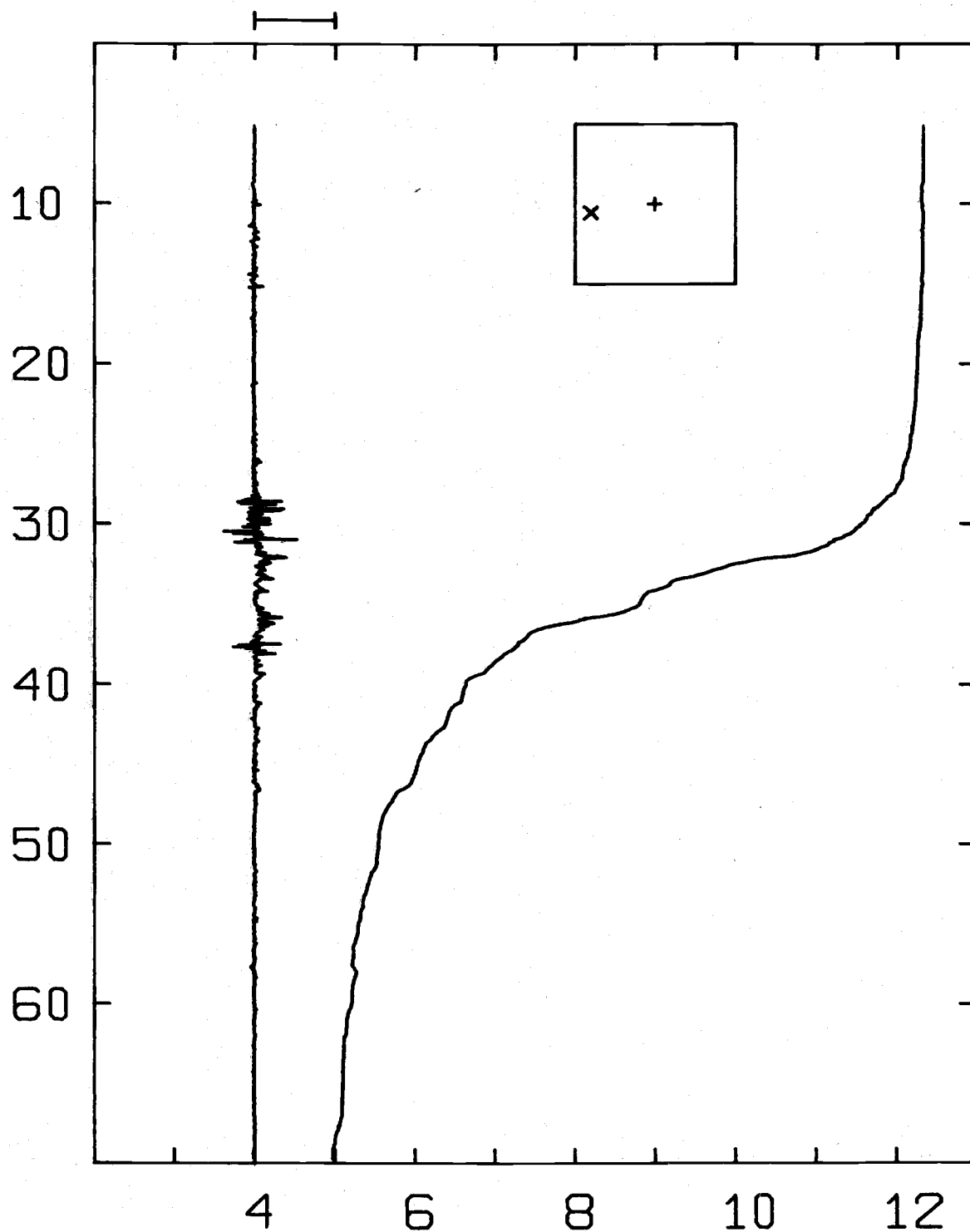
DATE 9/01/77

RANGE 4.23

TIME 0757

BEARING 82

3.00 DEG/M UNIT C P831B5



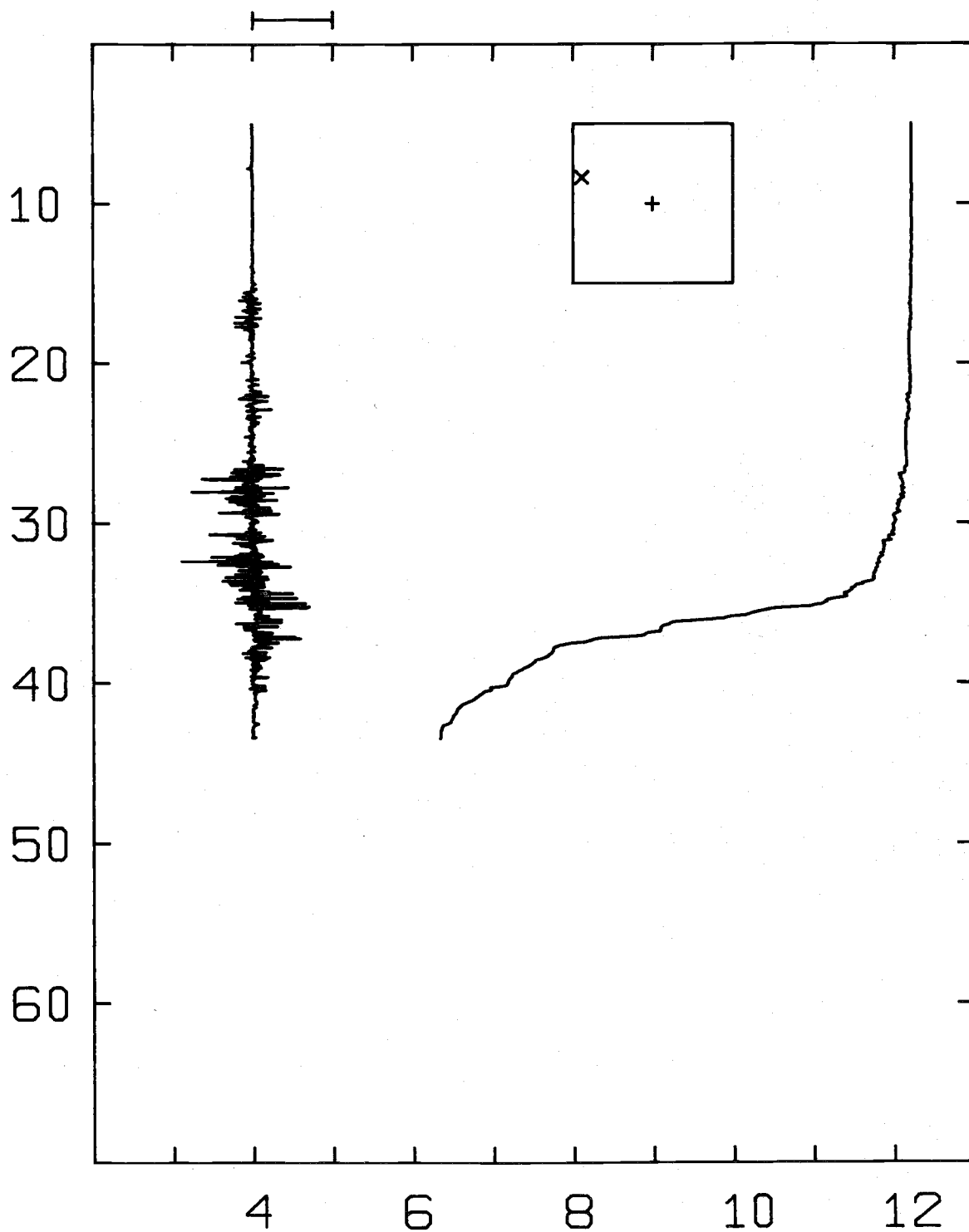
DATE 9/01/77

RANGE 4.04

TIME 0800

BEARING 82

10.0 DEG/M UNIT C P831C4



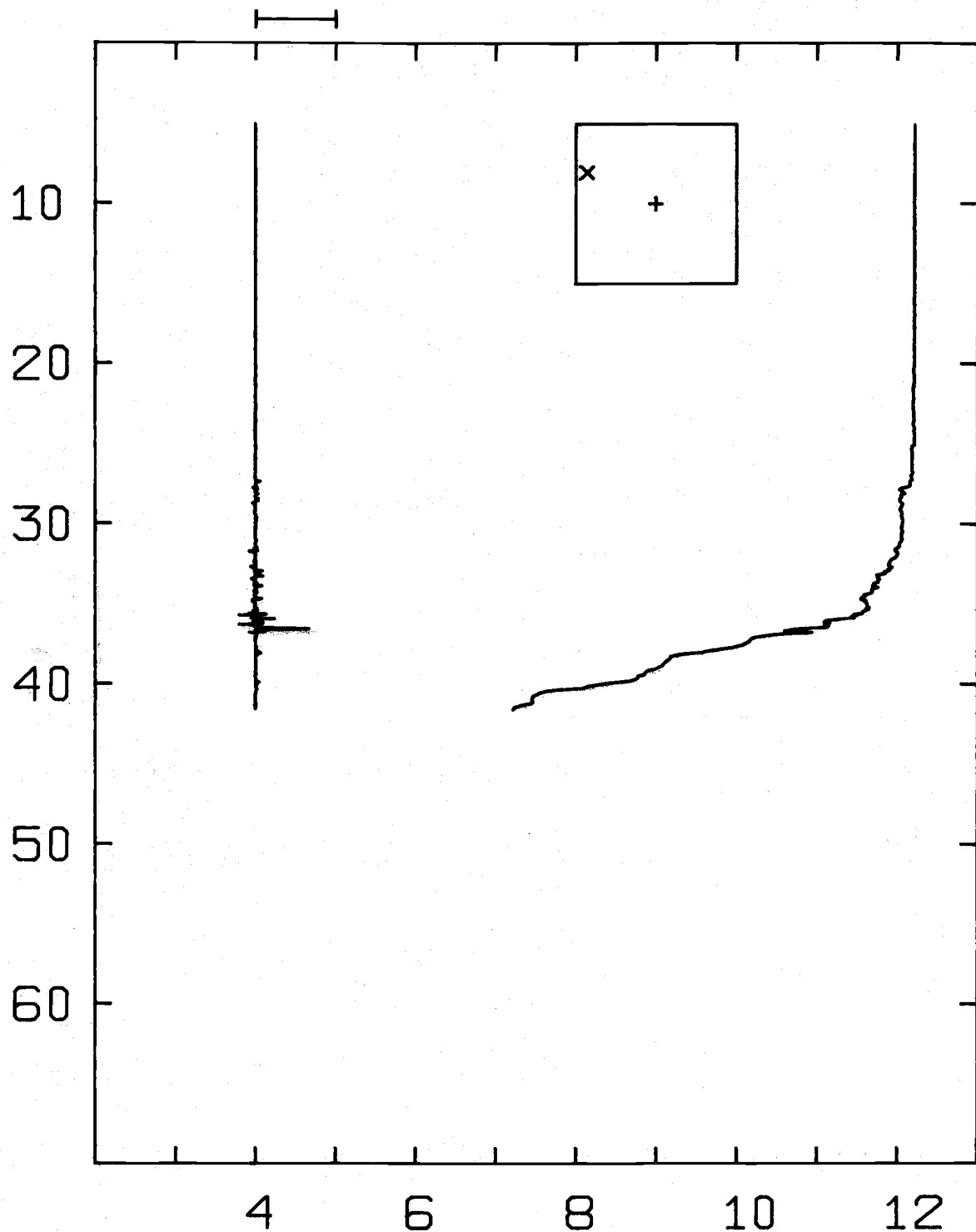
DATE 9/01/77

RANGE 4.73

TIME 1003

BEARING 110

100. DEG/M UNIT C P831C5



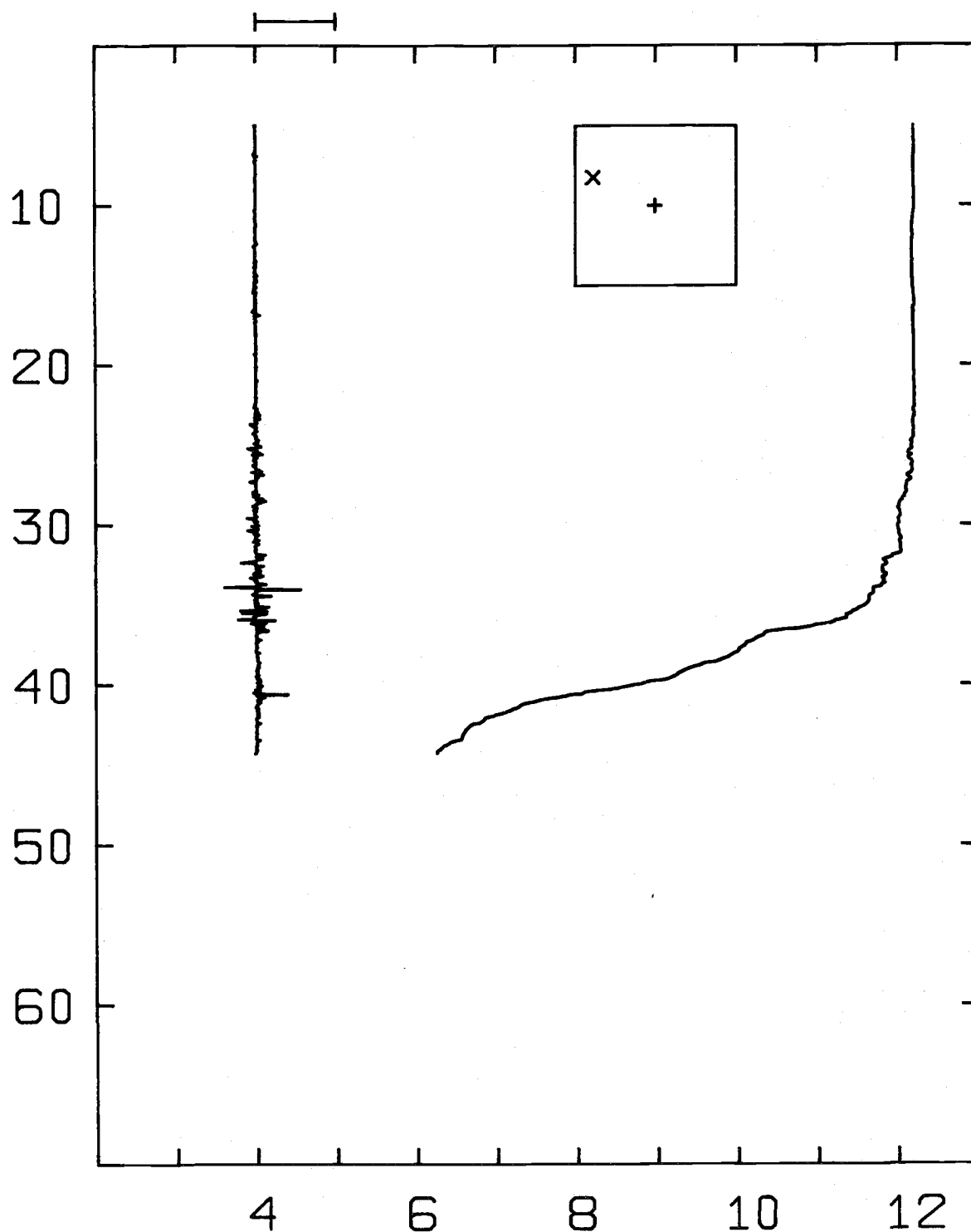
DATE 9/01/77

RANGE 4.73

TIME 1016

BEARING 114

30.0 DEG/M UNIT C P831C6



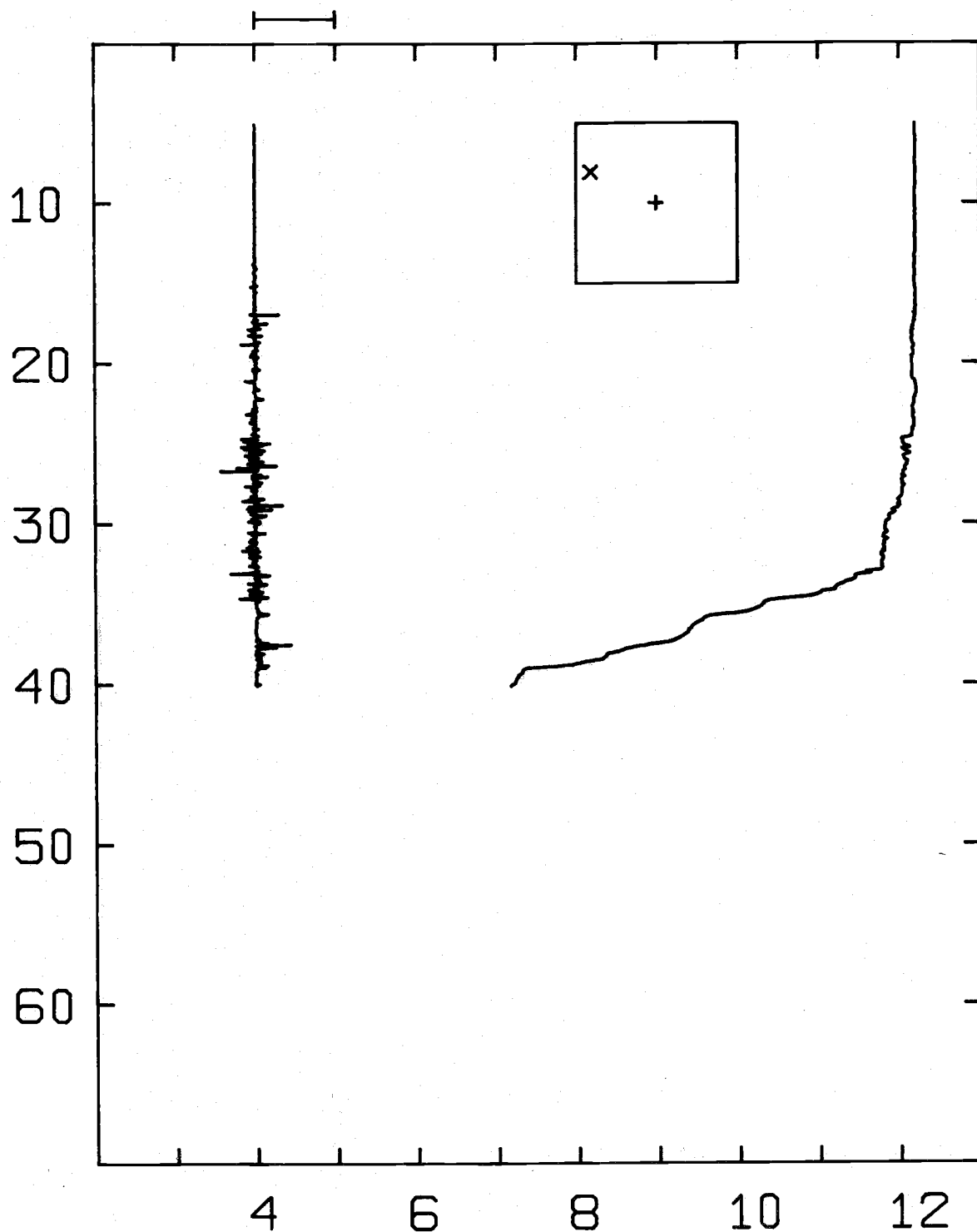
DATE 9/01/77

RANGE 4.26

TIME 1023

BEARING 114

30.0 DEG/M UNIT C P831C7



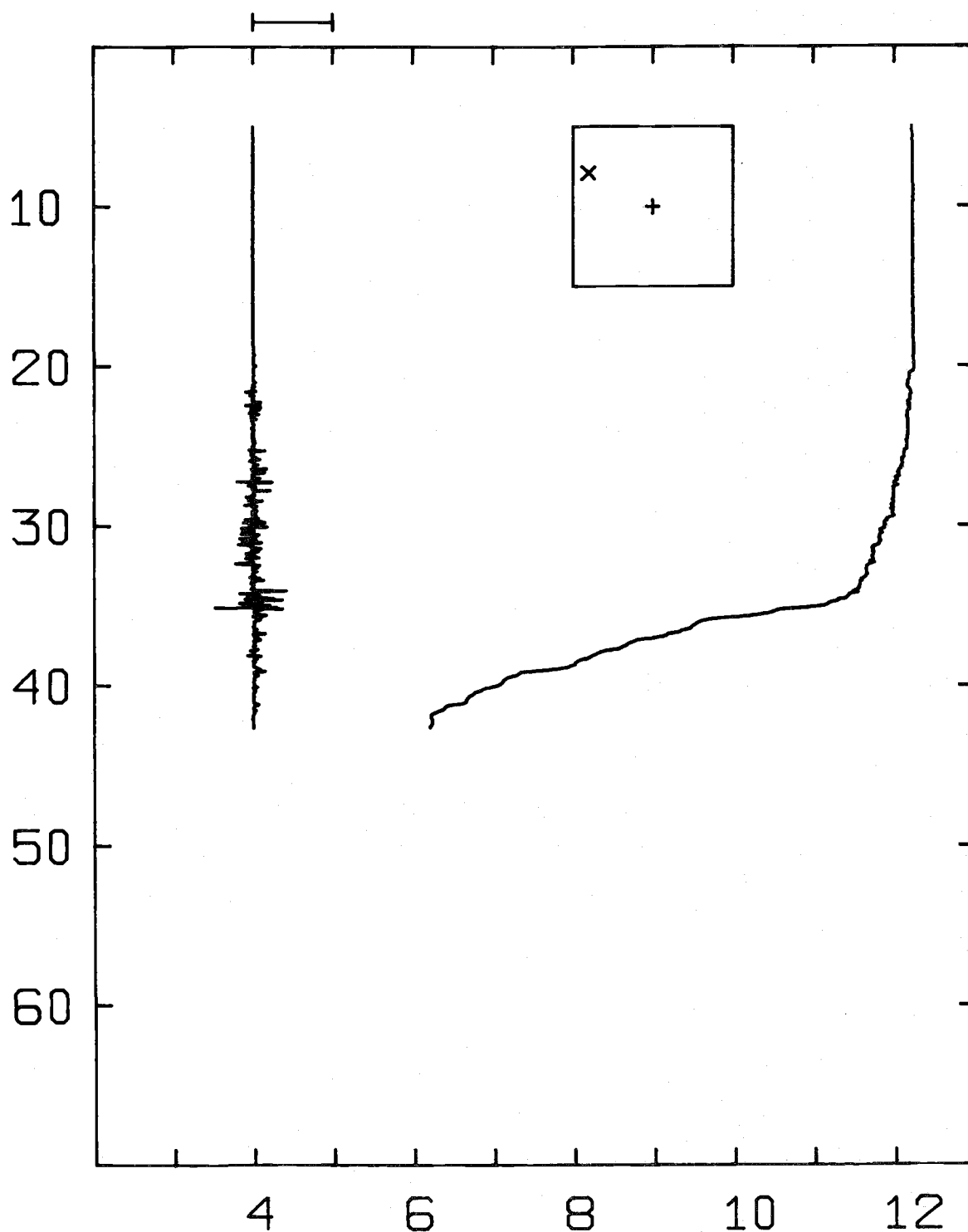
DATE 9/01/77

RANGE 4.50

TIME 1032

BEARING 115

30.0 DEG/M UNIT C P831C8



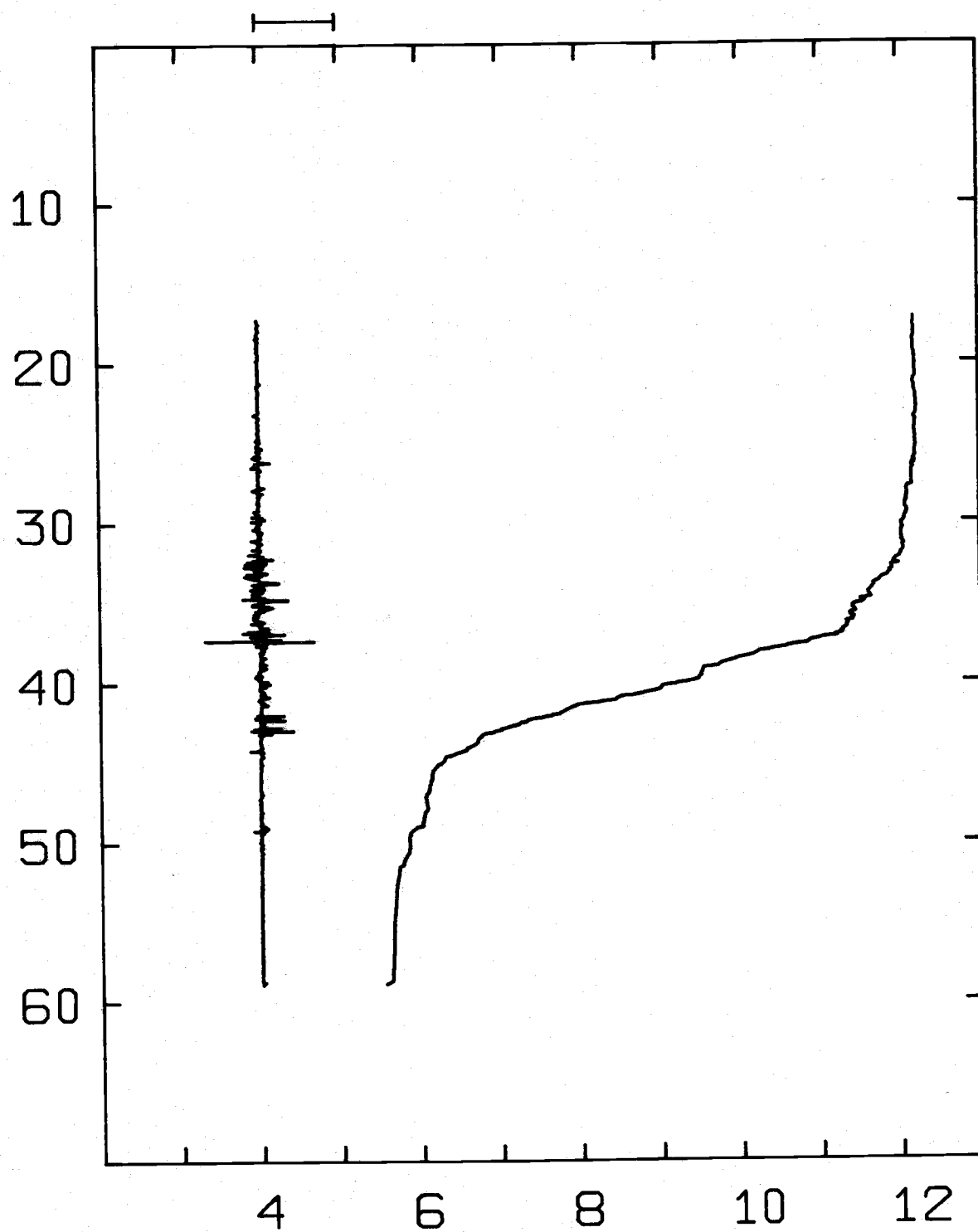
DATE 9/01/77

RANGE 4.52

TIME 1041

BEARING 117

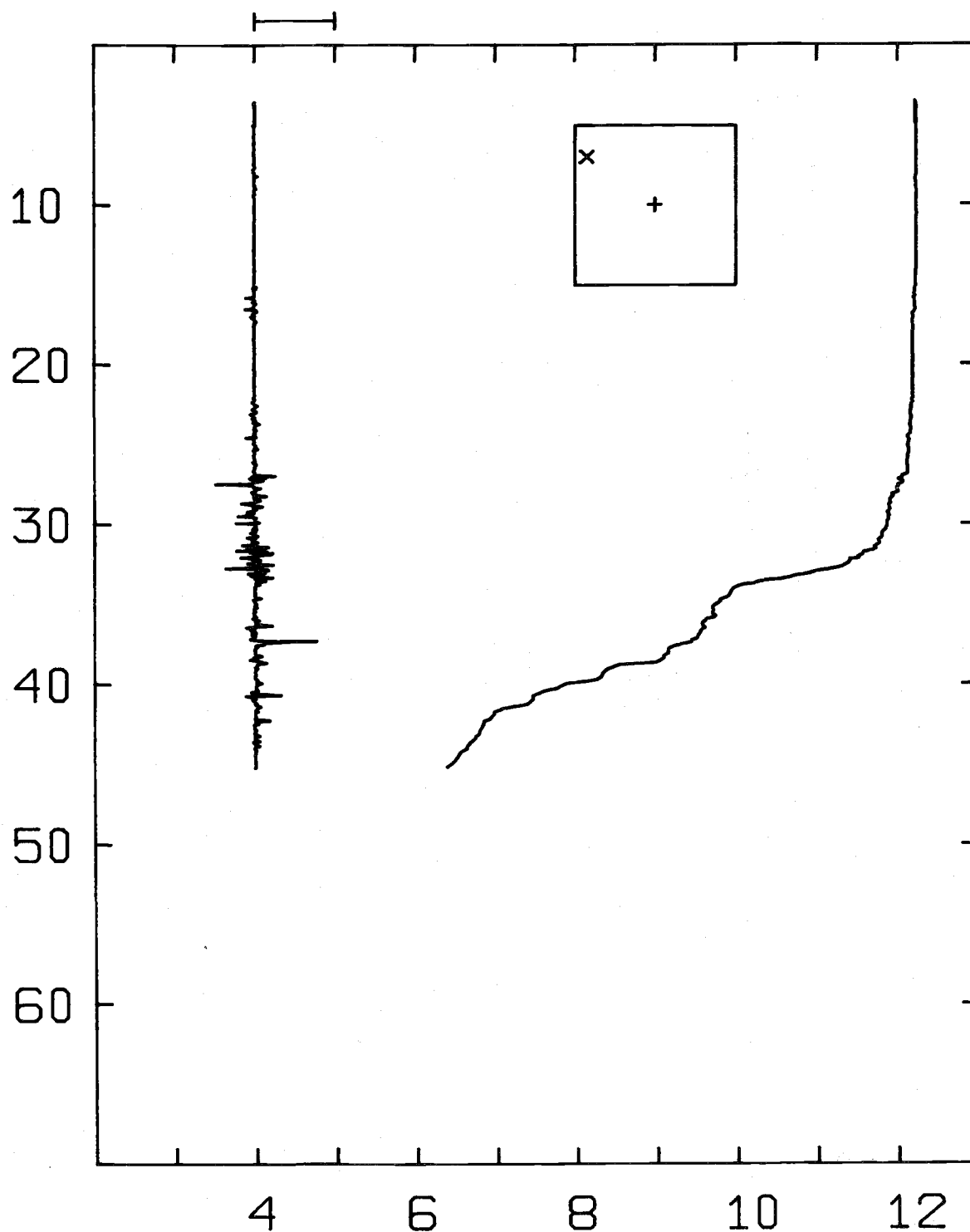
30.0 DEG/M UNIT C P831D1



DATE 9/01/77

TIME 1055

30.0 DEG/M UNIT C P831D2



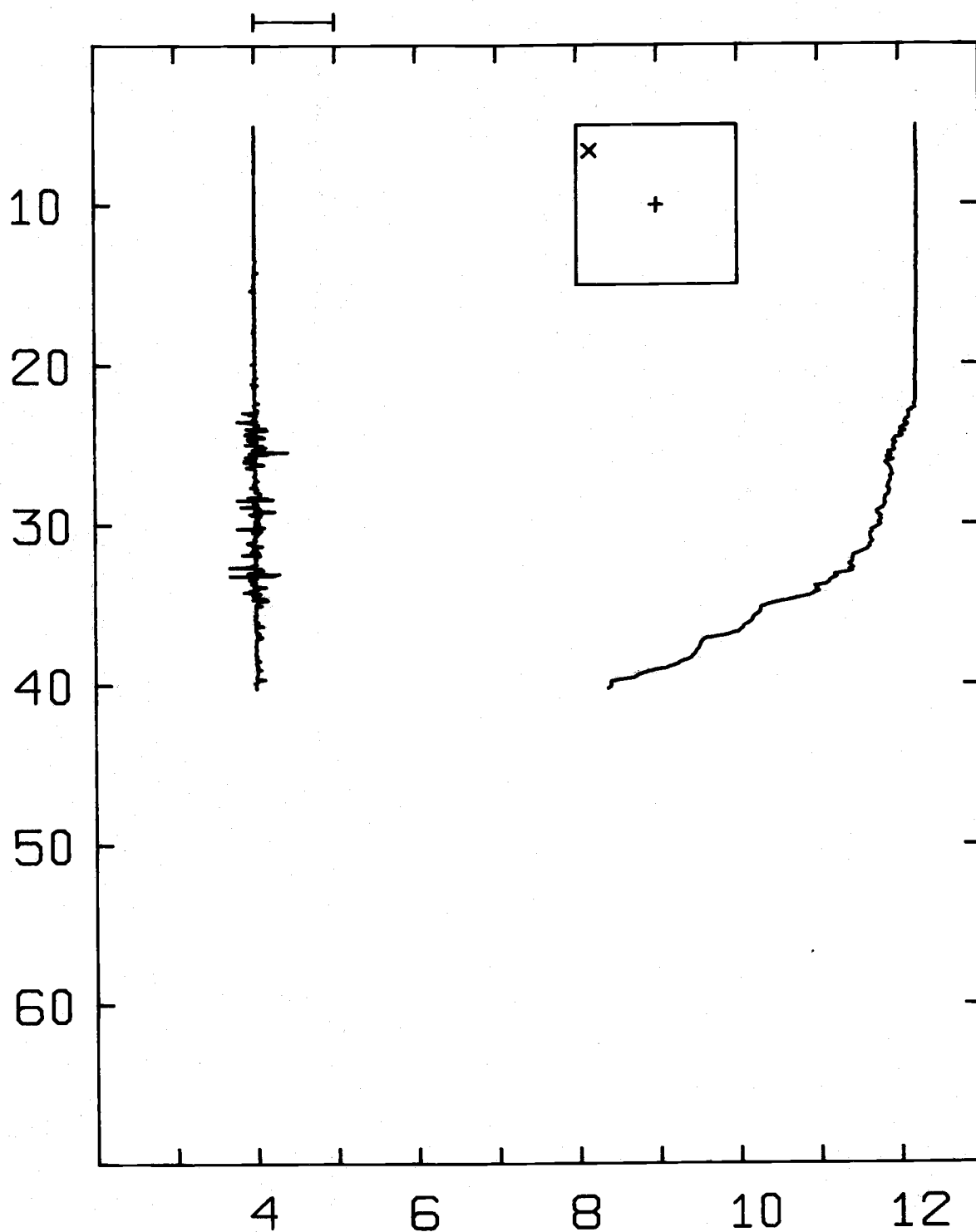
DATE 9/01/77

RANGE 5.19

TIME 1111

BEARING 125

30.0 DEG/M UNIT C P831D3



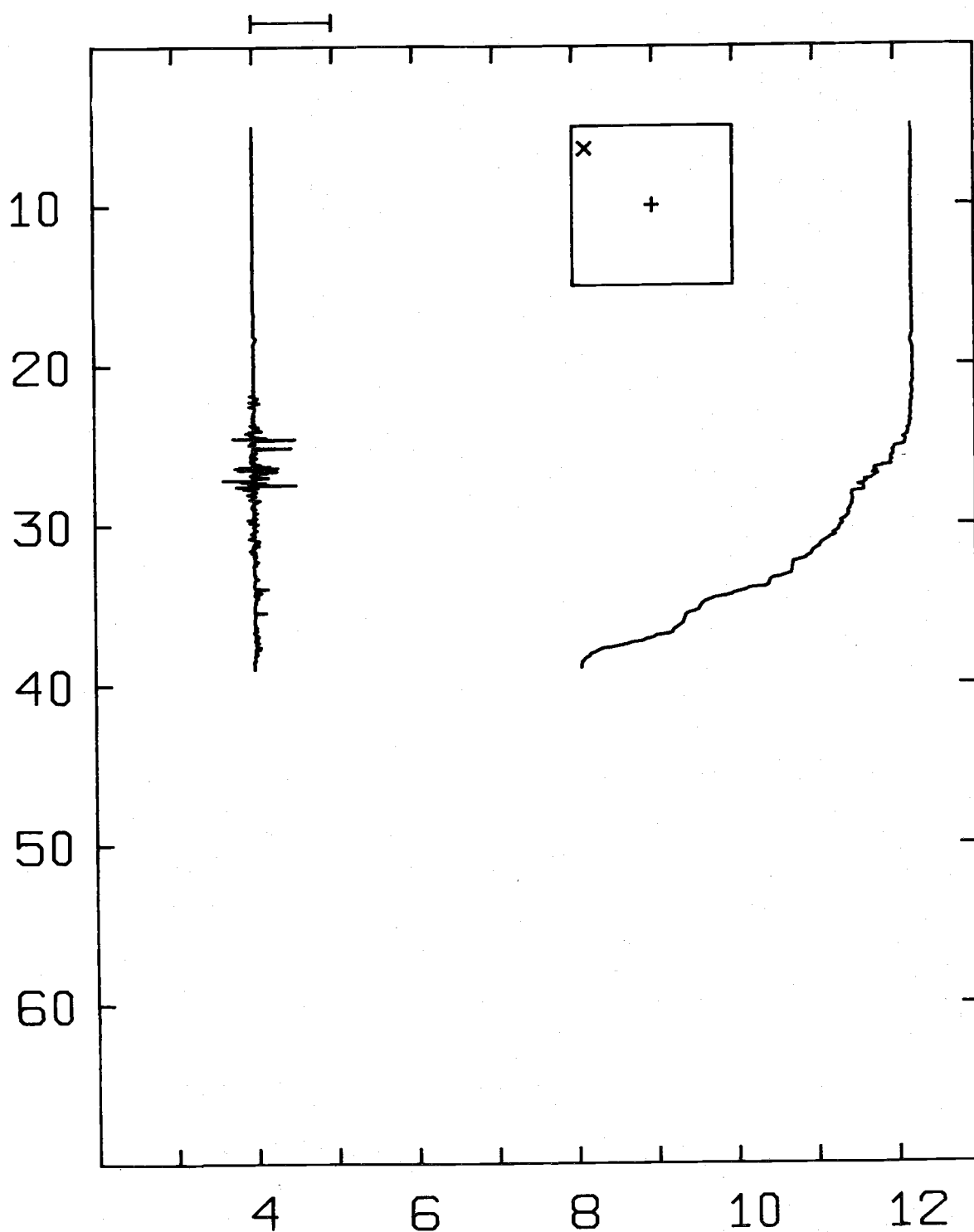
DATE 9/01/77

RANGE 5.37

TIME 1125

BEARING 129

30.0 DEG/M UNIT C P831D4



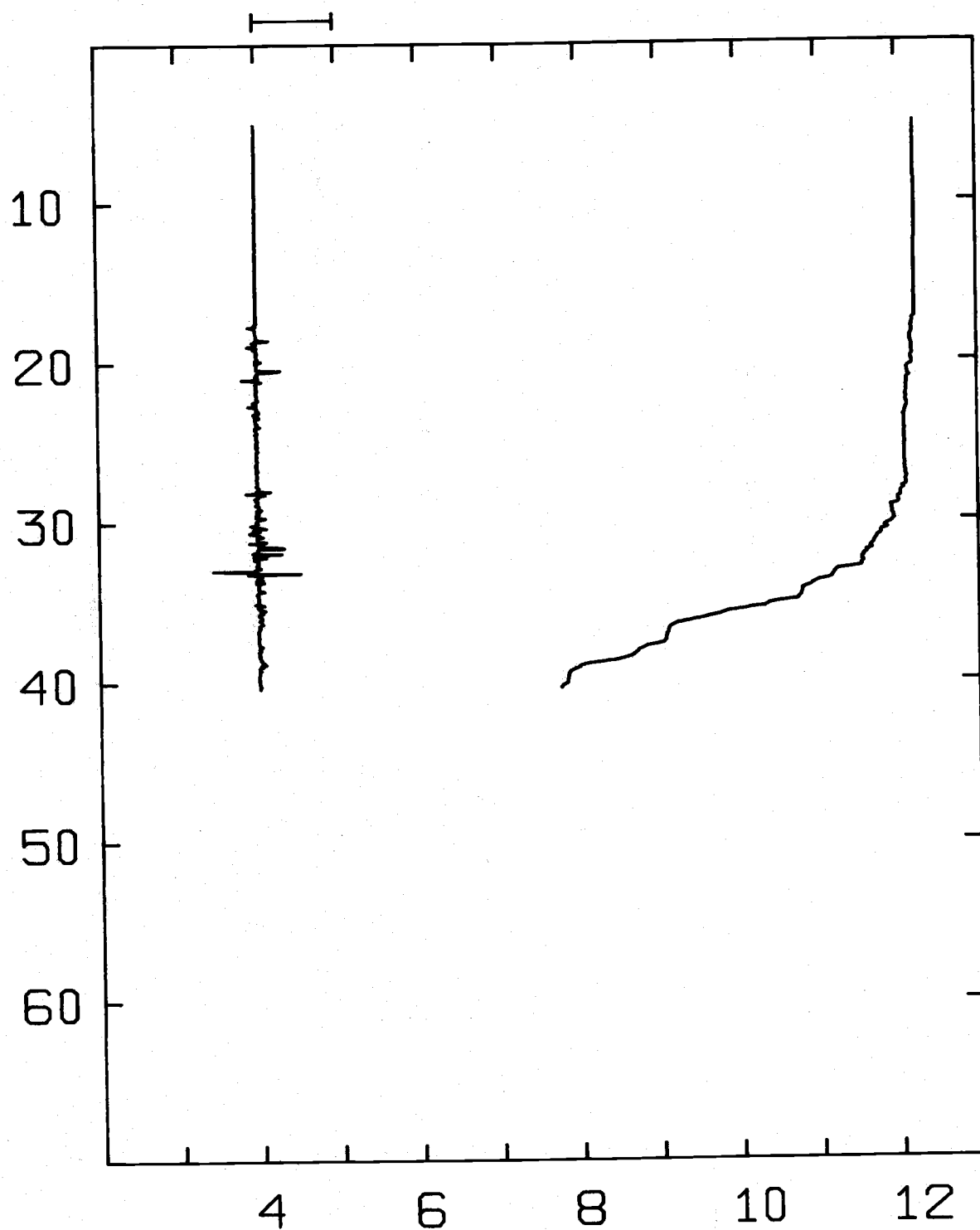
DATE 9/01/77

RANGE 5.49

TIME 1133

BEARING 130

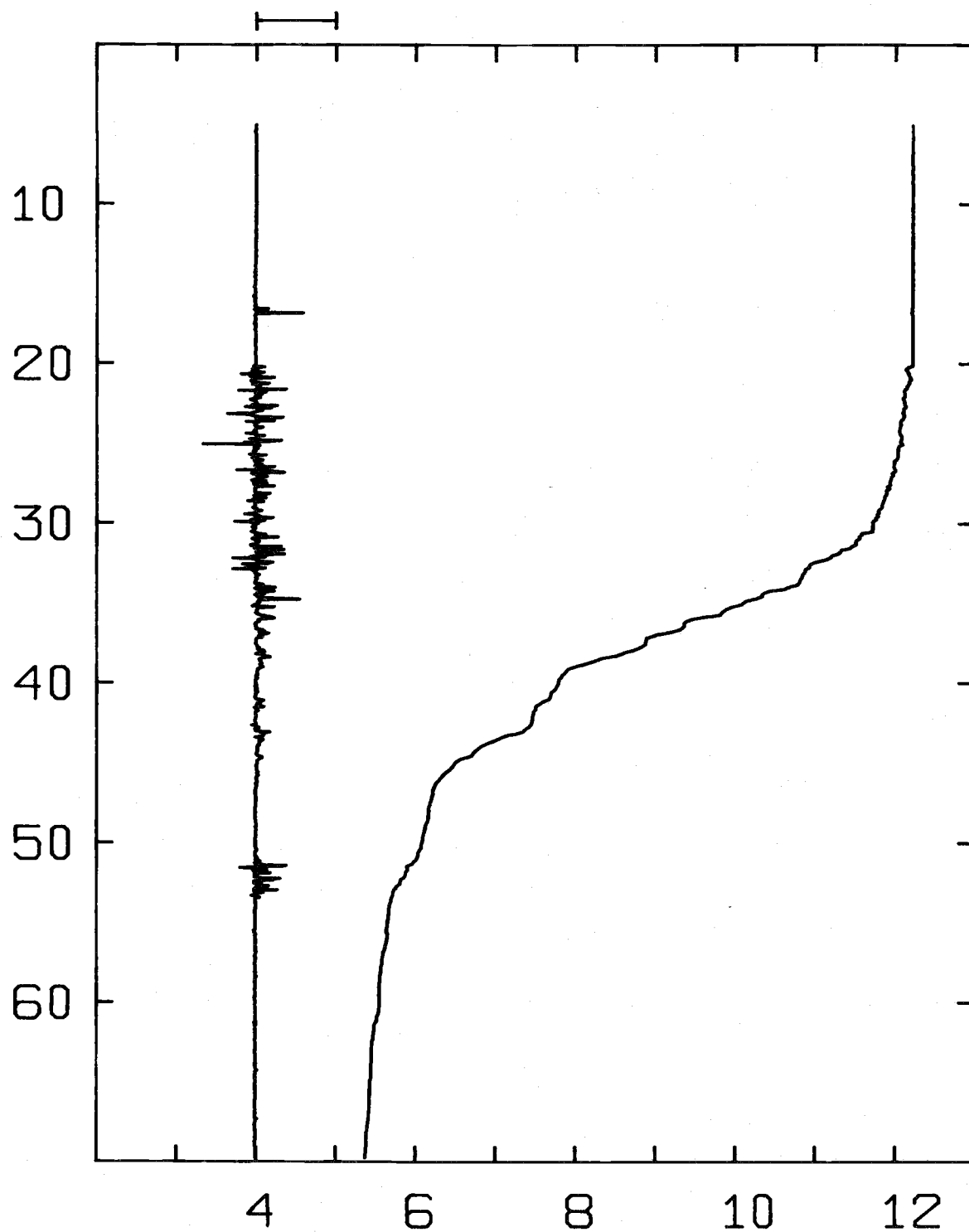
30.0 DEG/M UNIT C P831D5



DATE 9/01/77

TIME 1140

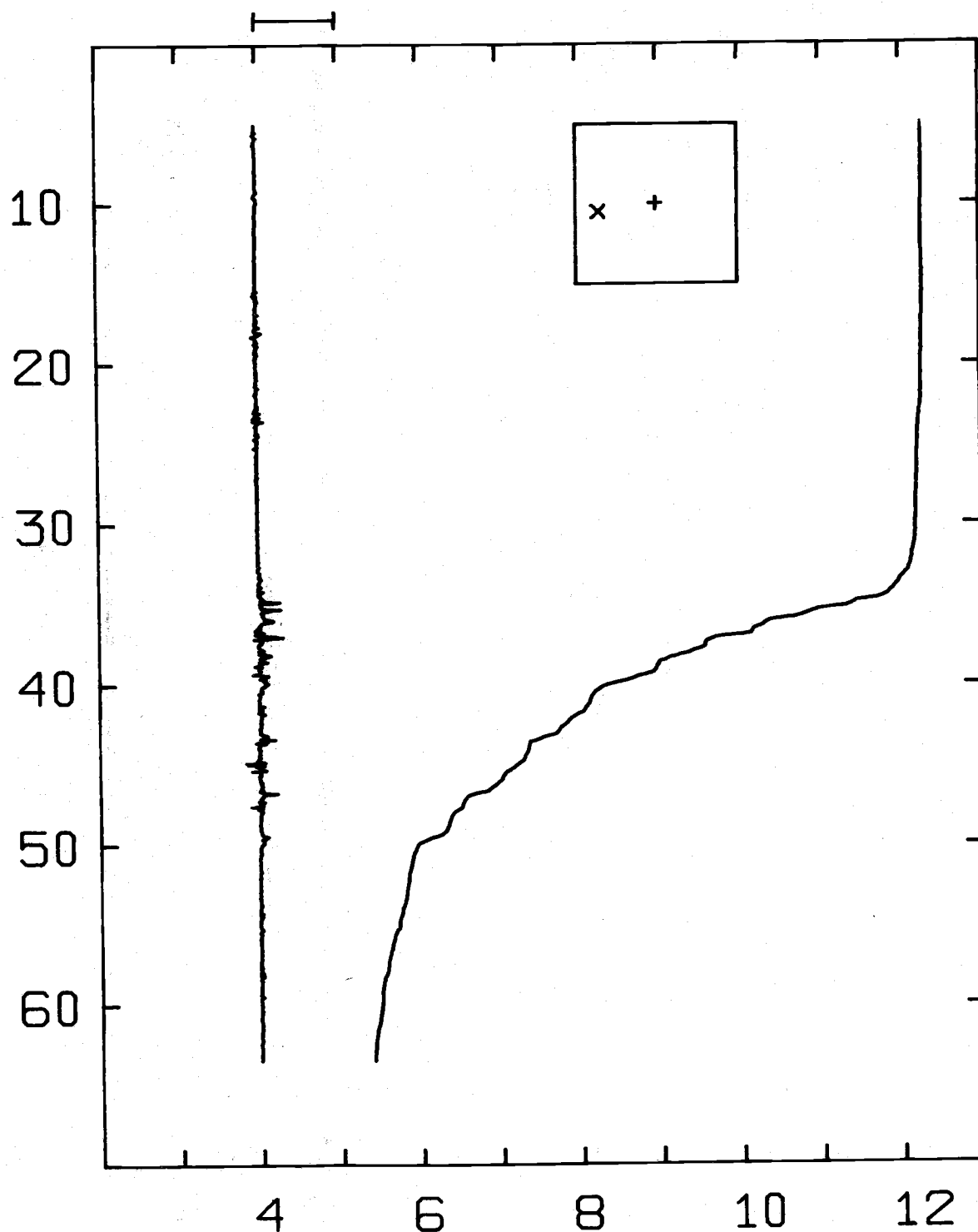
10.0 DEG/M UNIT C P831D6



DATE 9/01/77

TIME 1148

10.0 DEG/M UNIT C P91A1



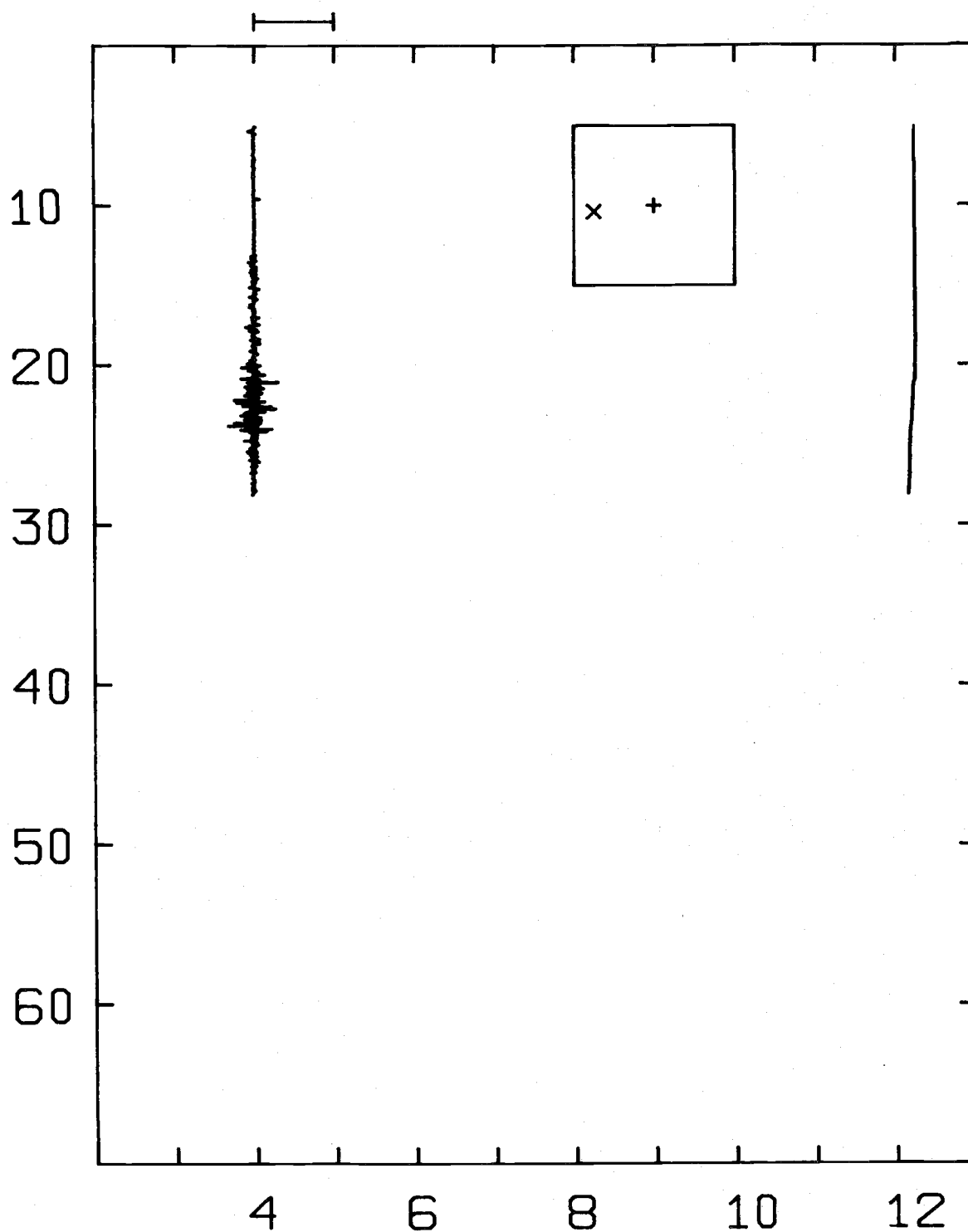
DATE 9/02/77

RANGE 3.61

TIME 0537

BEARING 82

3.00 DEG/M UNIT C P91A2



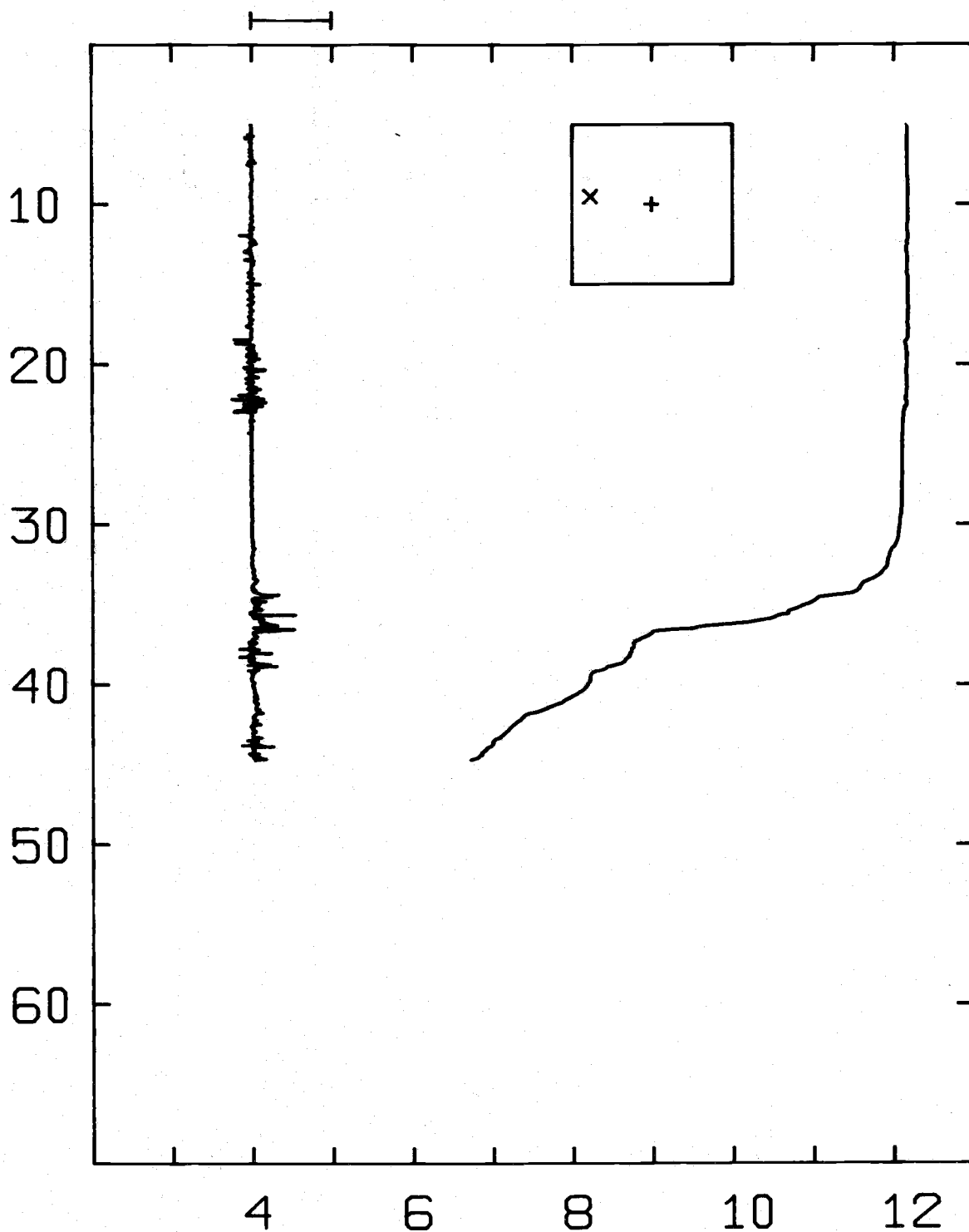
DATE 9/02/77

RANGE 3.76

TIME 0547

BEARING 84

10.0 DEG/M UNIT C P91A3



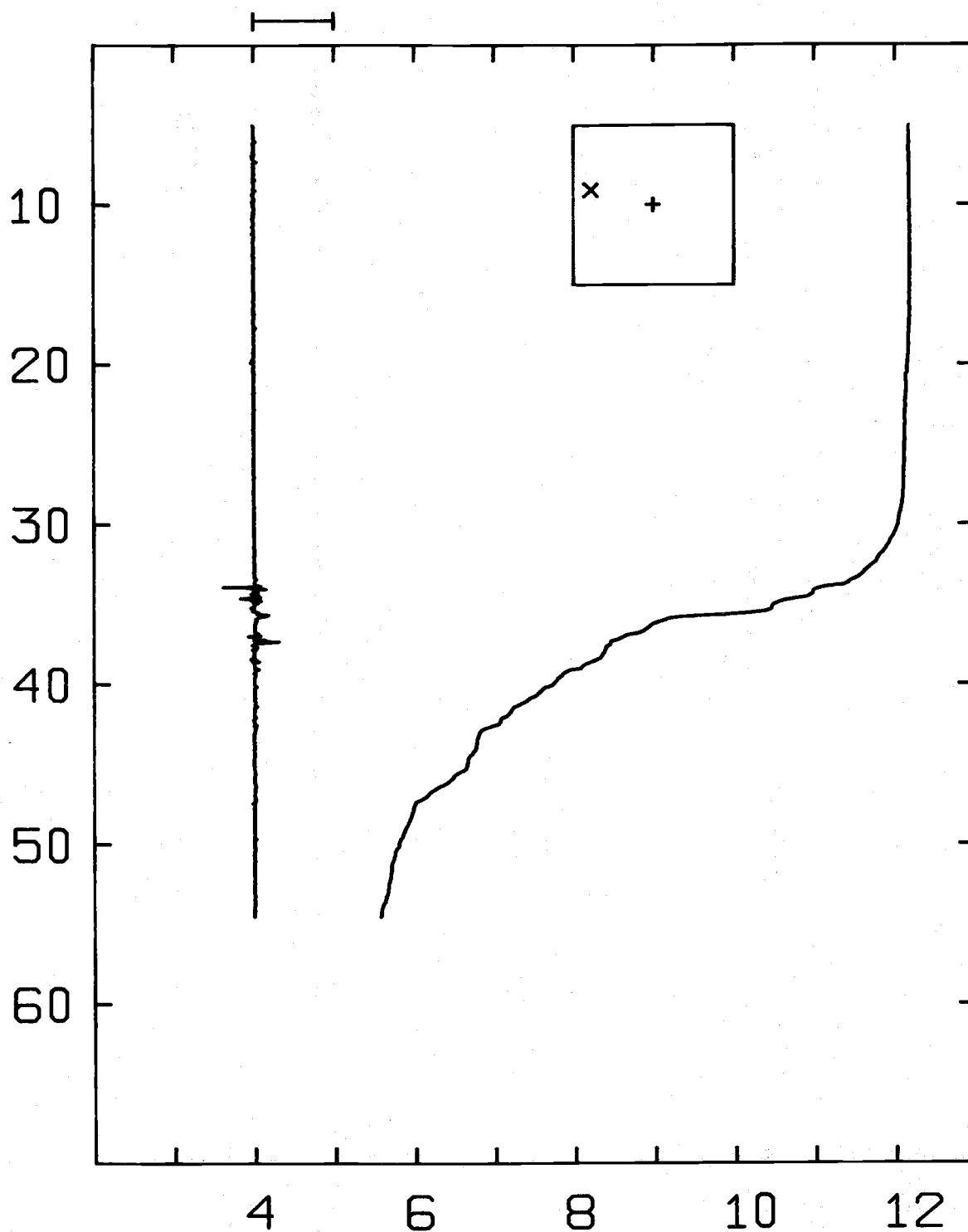
DATE 9/02/77

RANGE 3.87

TIME 0629

BEARING 97

30.0 DEG/M UNIT C P91A4



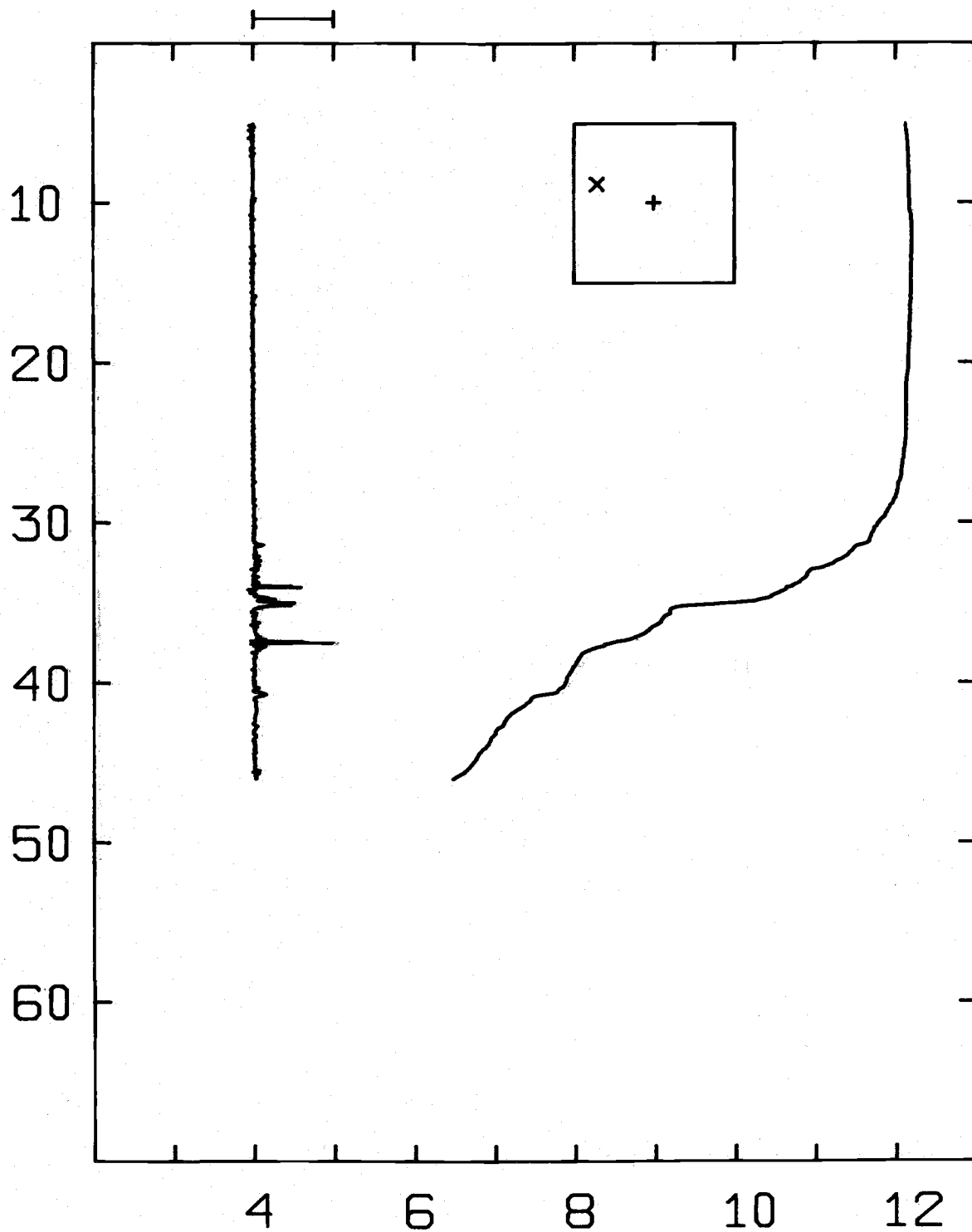
DATE 9/02/77

RANGE 4.02

TIME 0640

BEARING 103

10.0 DEG/M UNIT C P91A5



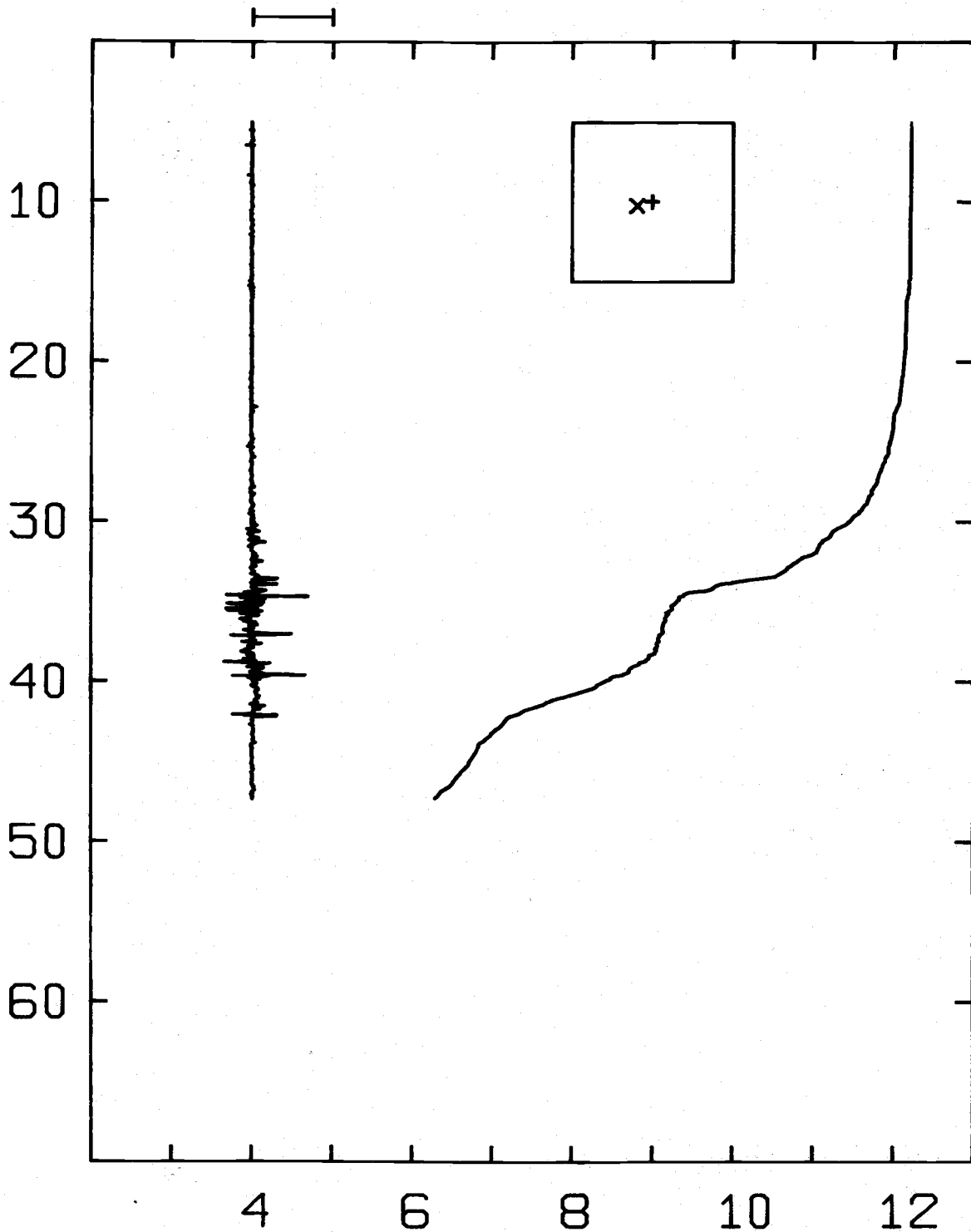
DATE 9/02/77

RANGE 3.74

TIME 0652

BEARING 108

10.0 DEG/M UNIT C P91B7



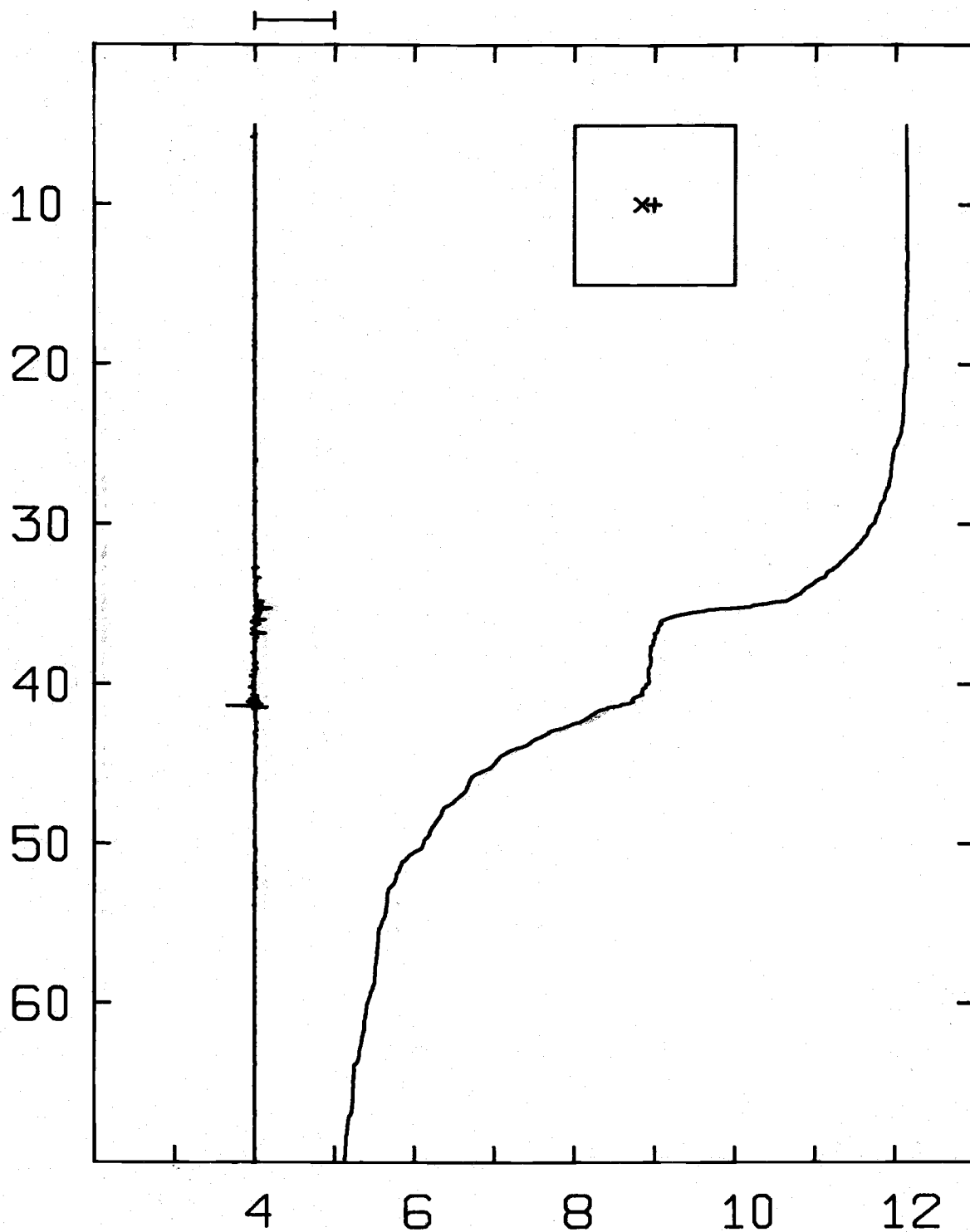
DATE 9/02/77

RANGE 1.00

TIME 0944

BEARING 76

30.0 DEG/M UNIT C P91B8



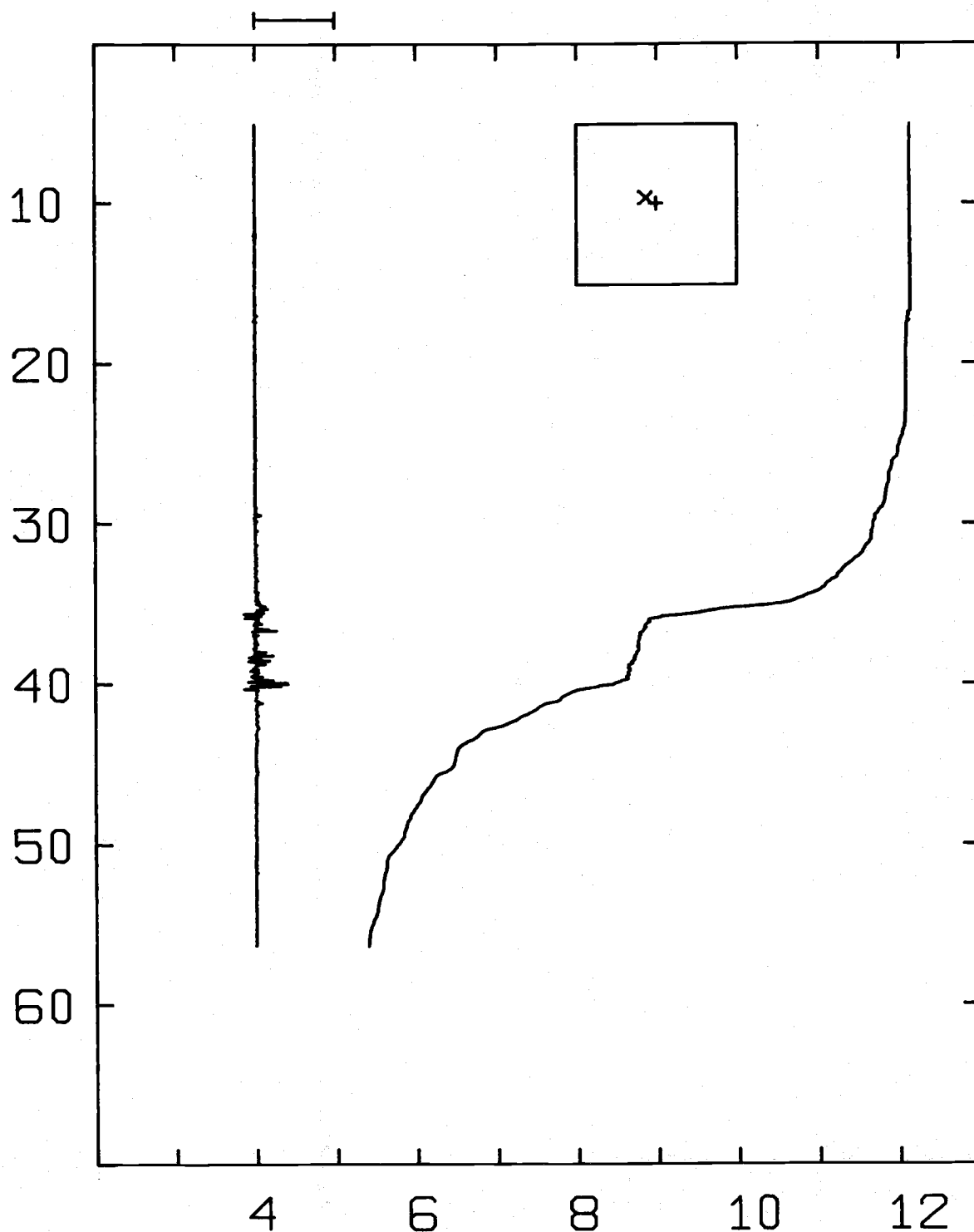
DATE 9/02/77

RANGE .815

TIME 0956

BEARING 90

30.0 DEG/M UNIT C P91C1



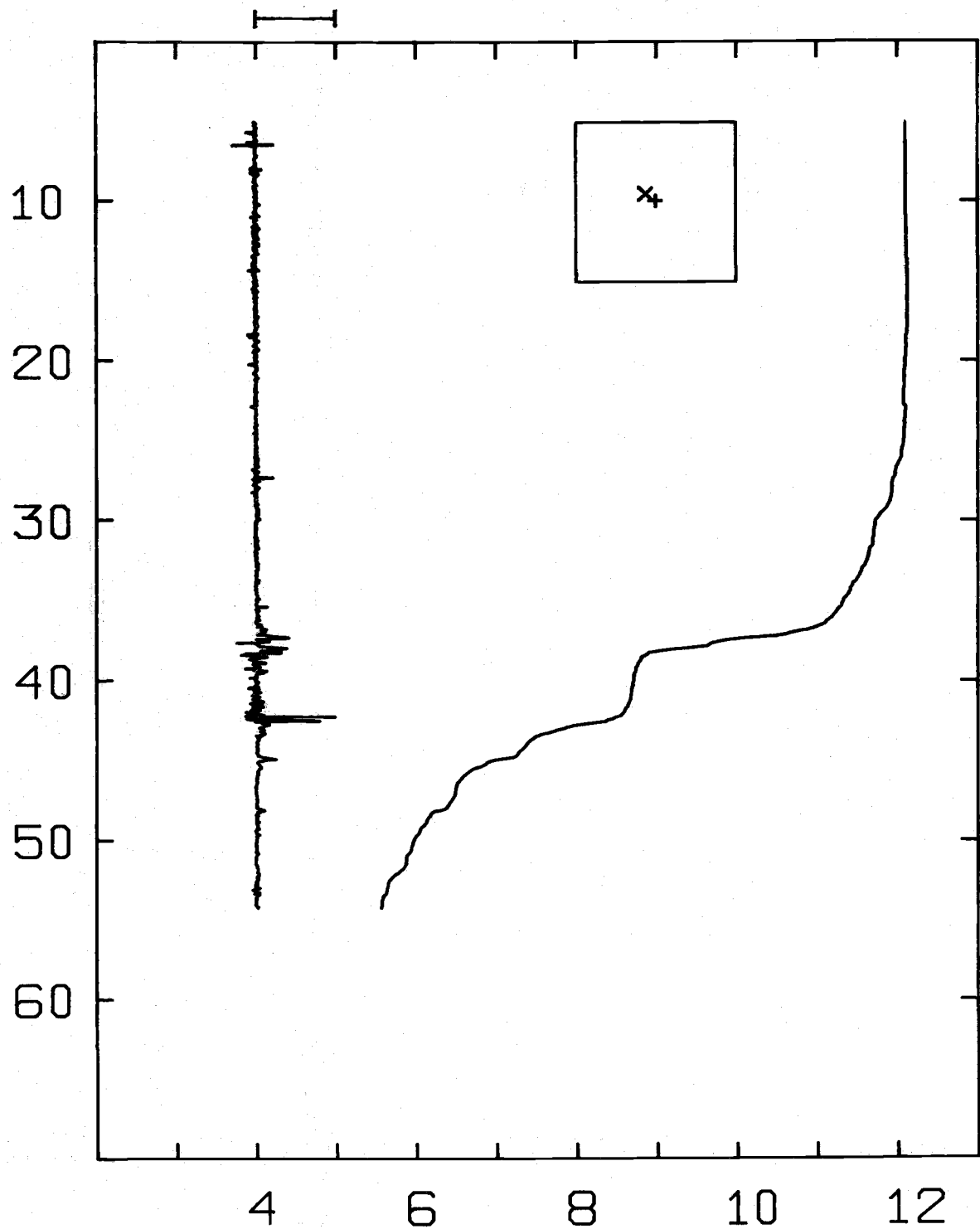
DATE 9/02/77

RANGE .760

TIME 1008

BEARING 116

10.0 DEG/M UNIT C P91C2



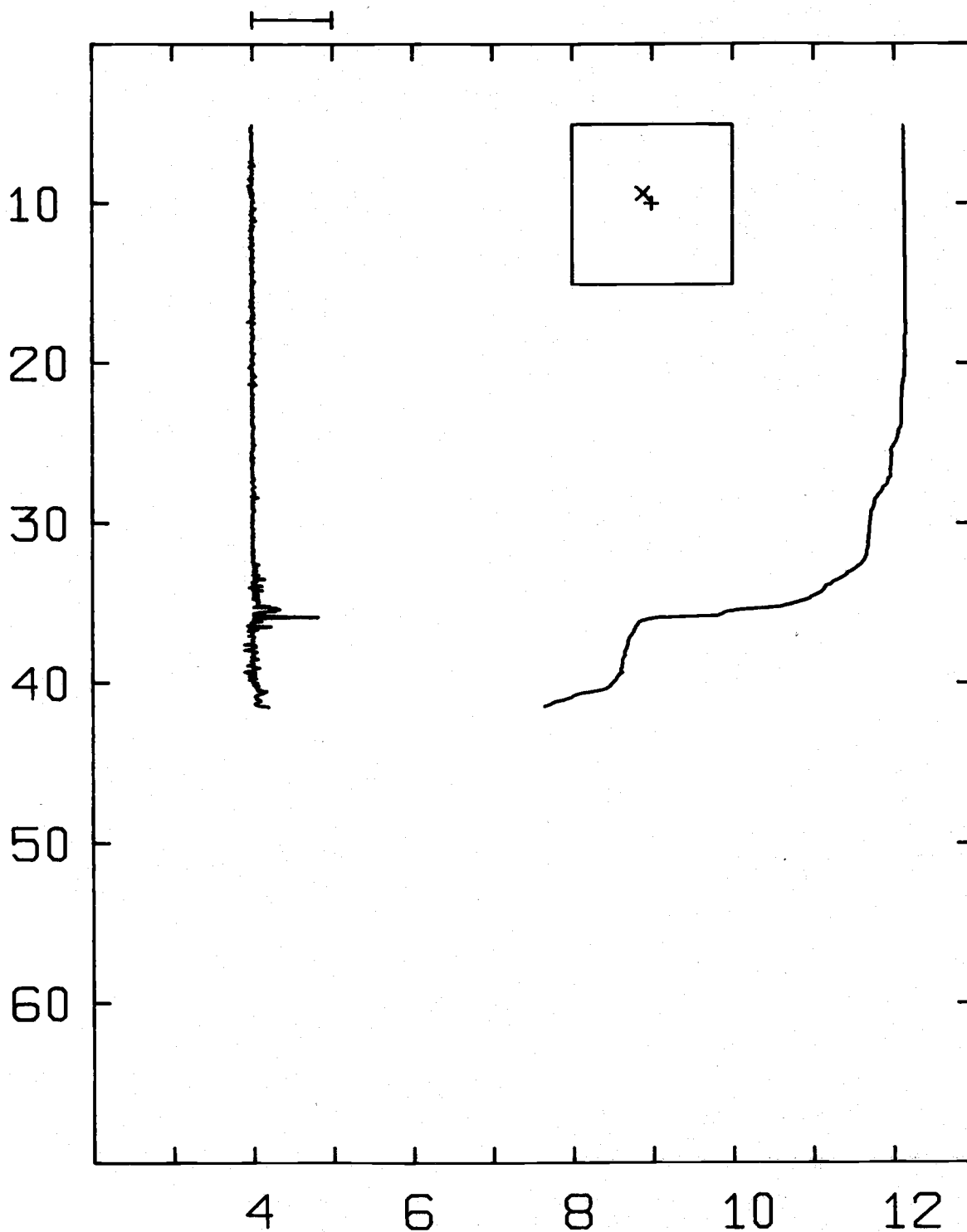
DATE 9/02/77

RANGE .815

TIME 1018

BEARING 126

10.0 DEG/M UNIT C P91C3



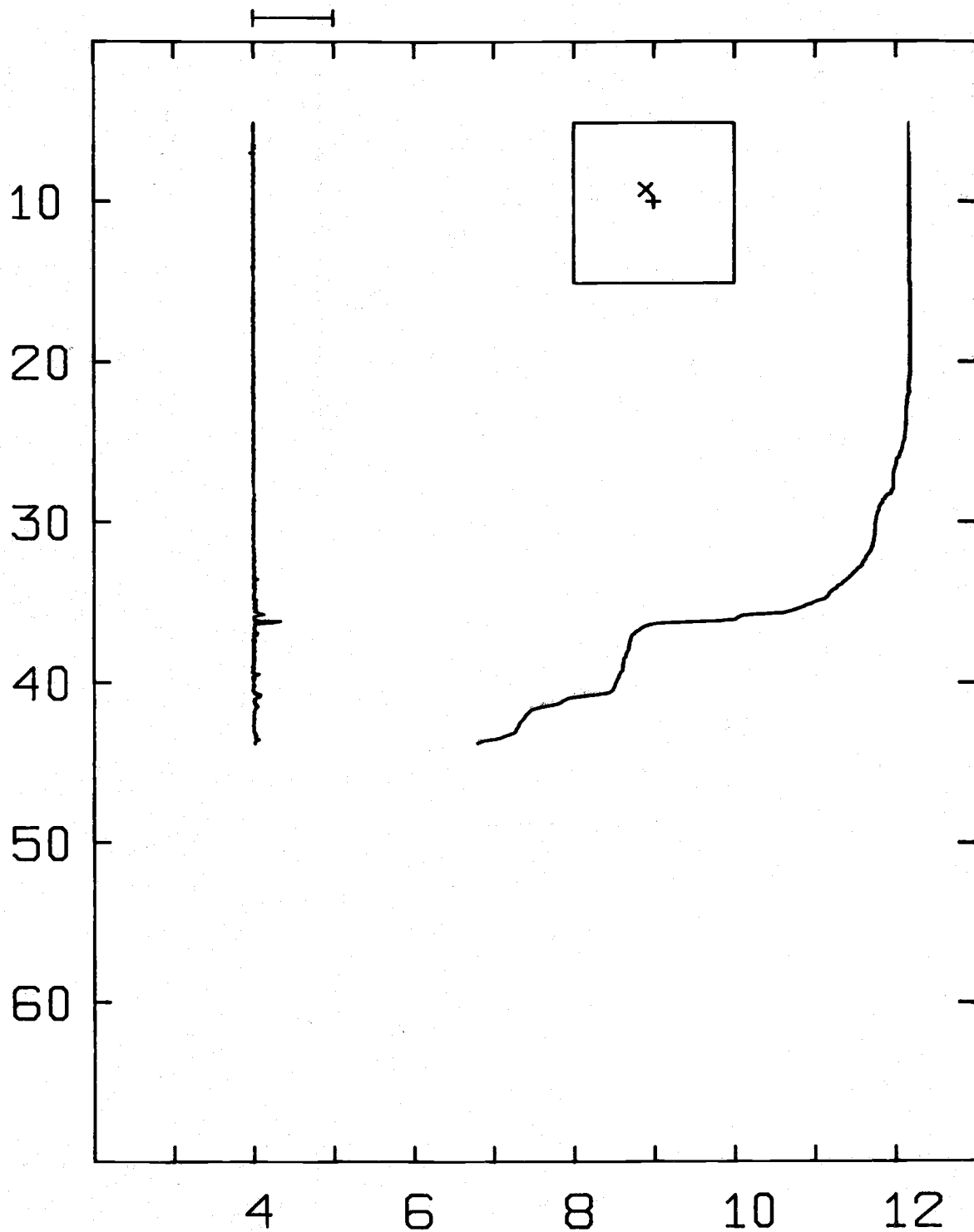
DATE 9/02/77

RANGE .834

TIME 1027

BEARING 137

30.0 DEG/M UNIT C P91C4



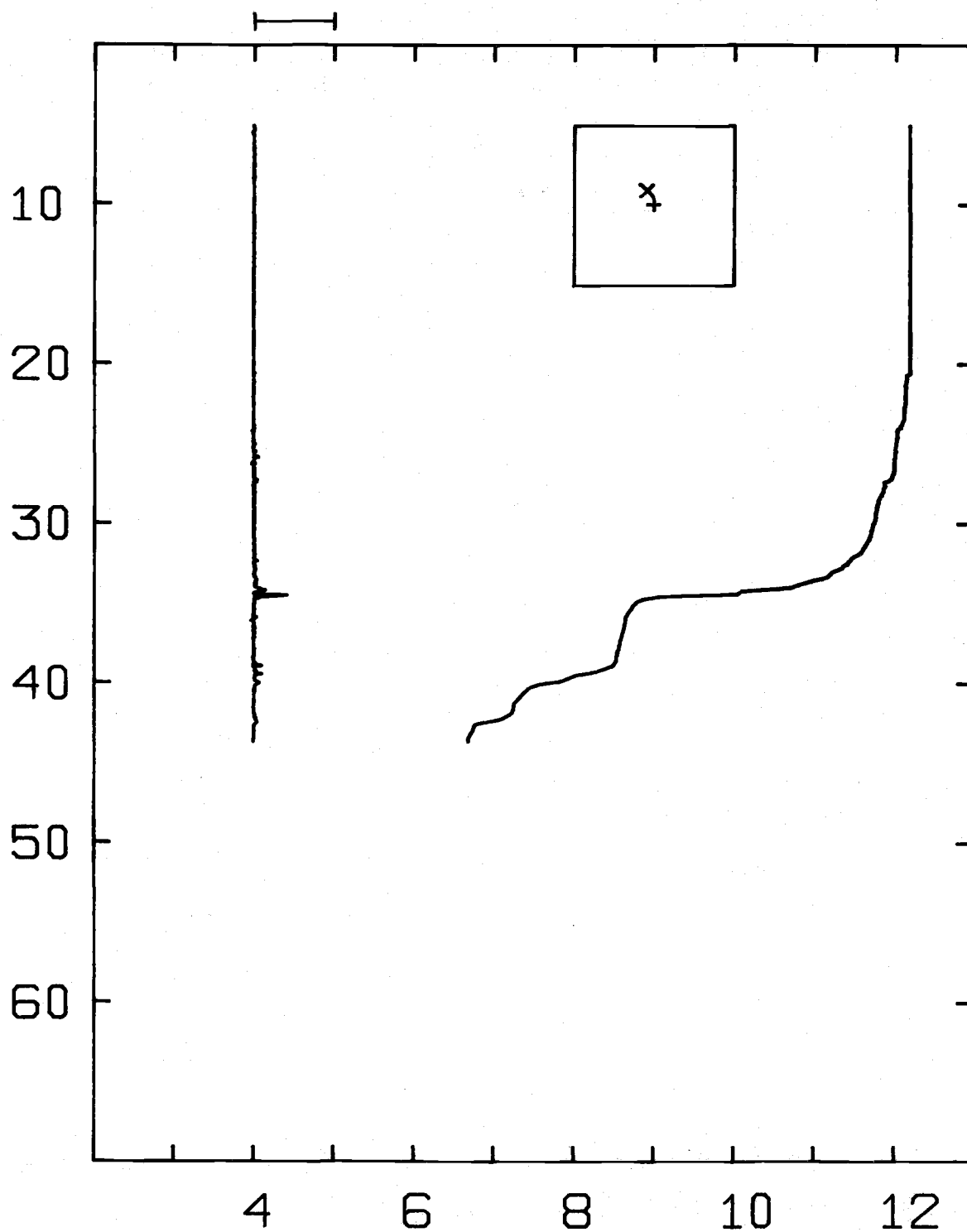
DATE 9/02/77

RANGE .927

TIME 1035

BEARING 146

30.0 DEG/M UNIT C P91C5



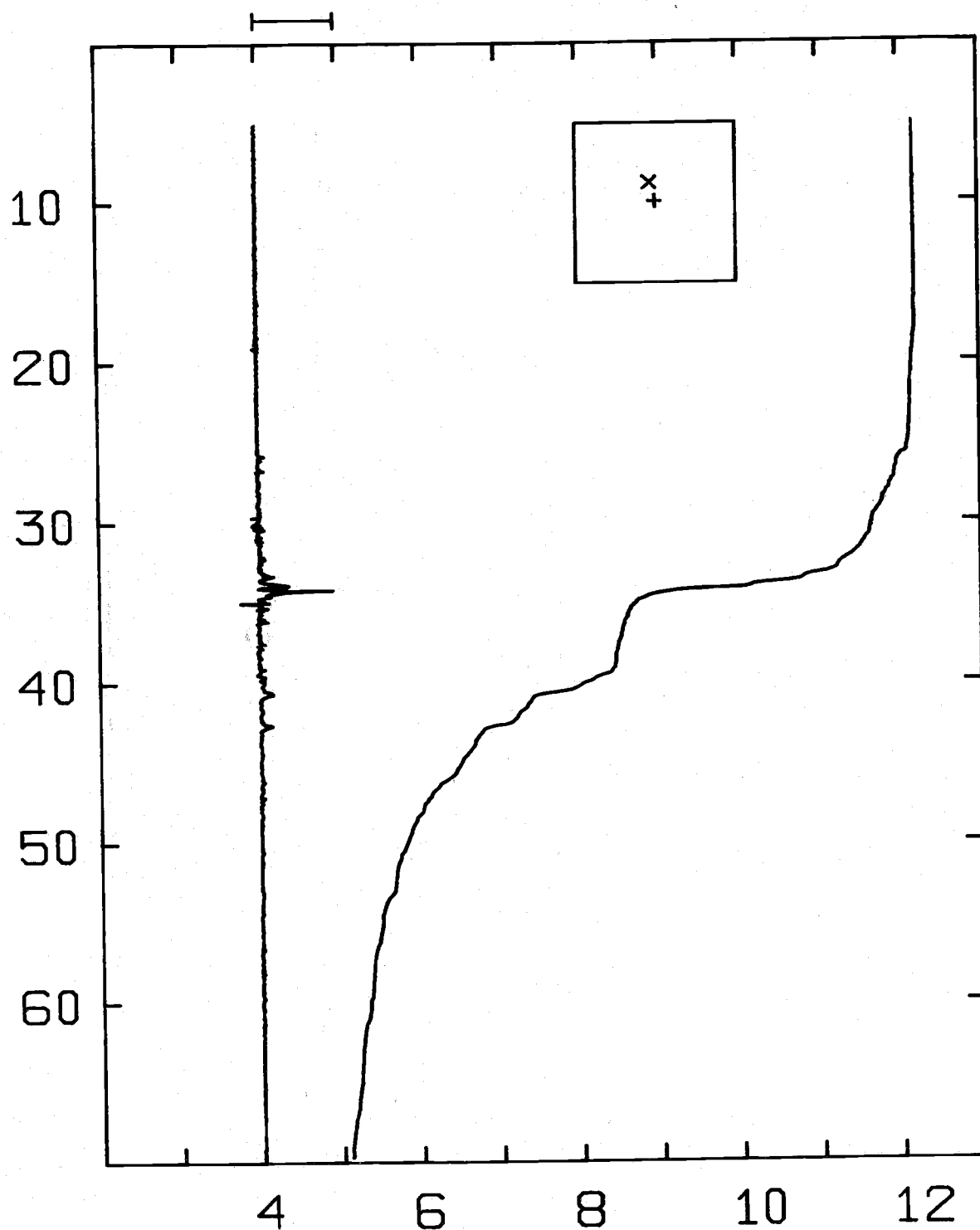
DATE 9/02/77

RANGE 1.02

TIME 1043

BEARING 152

10.0 DEG/M UNIT C P91CB6



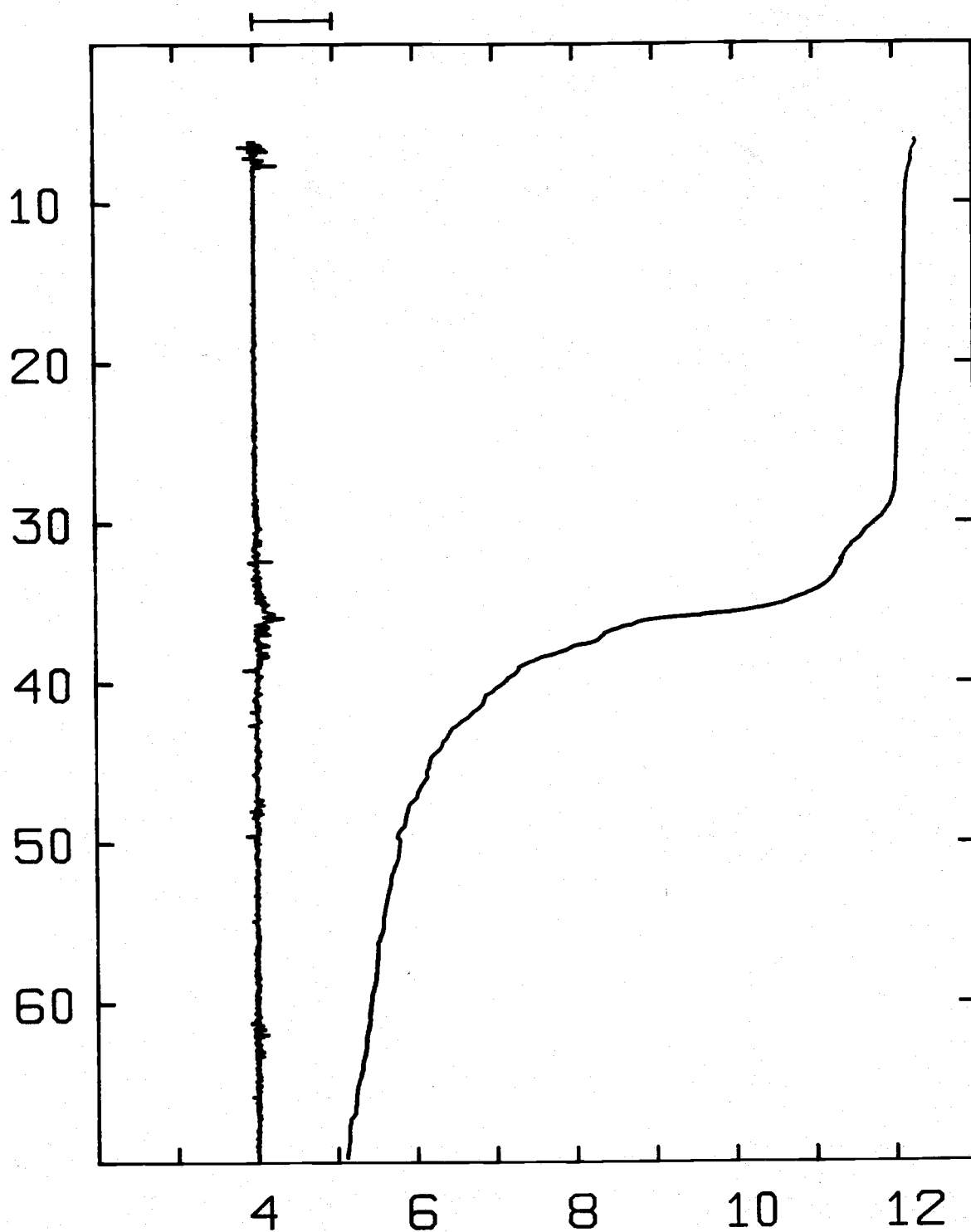
DATE 9/02/77

RANGE 1.22

TIME 1057

BEARING 162

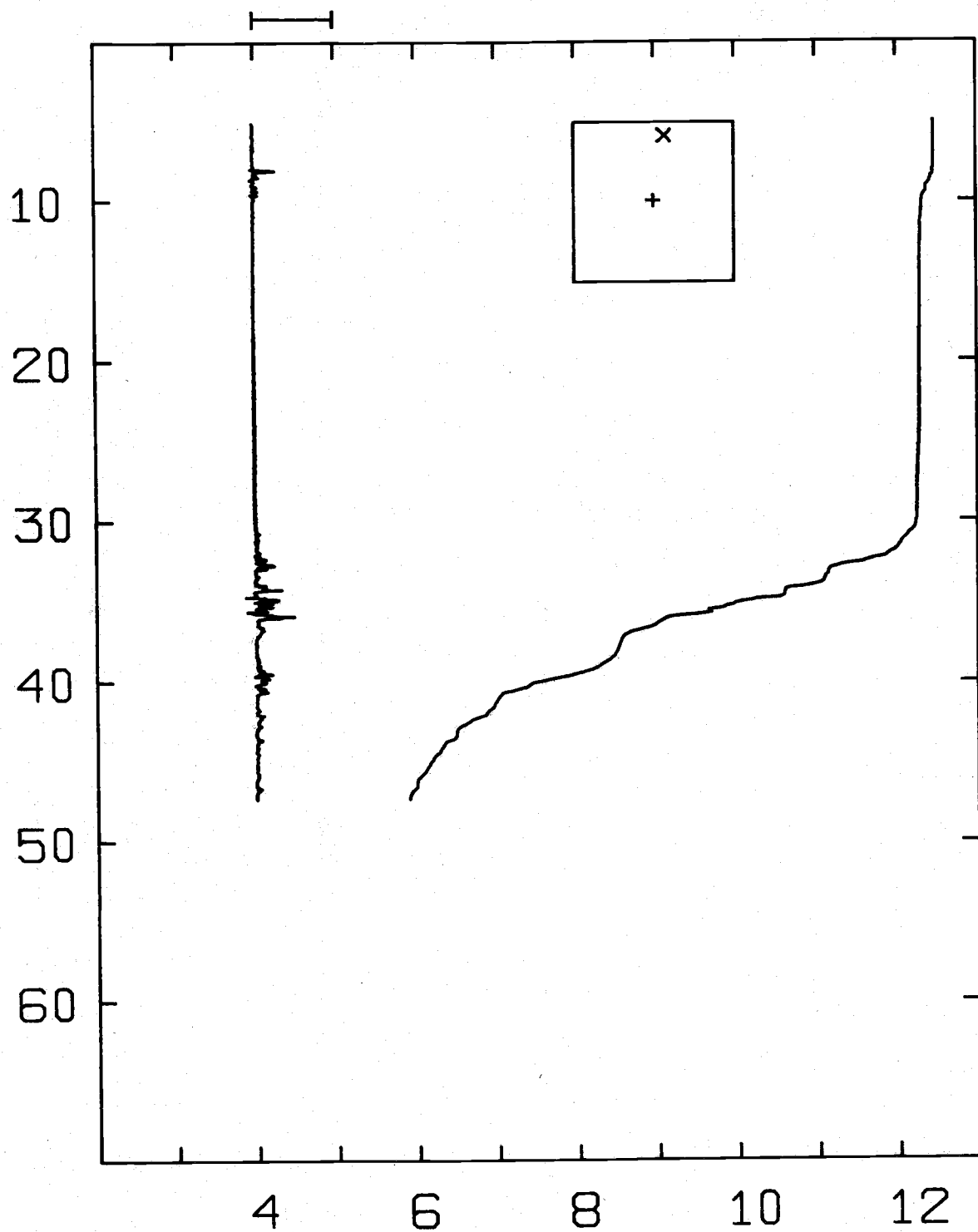
10.0 DEG/M UNIT C P92B1



DATE 9/03/77

TIME 0741

10.0 DEG/M UNIT C P92B2



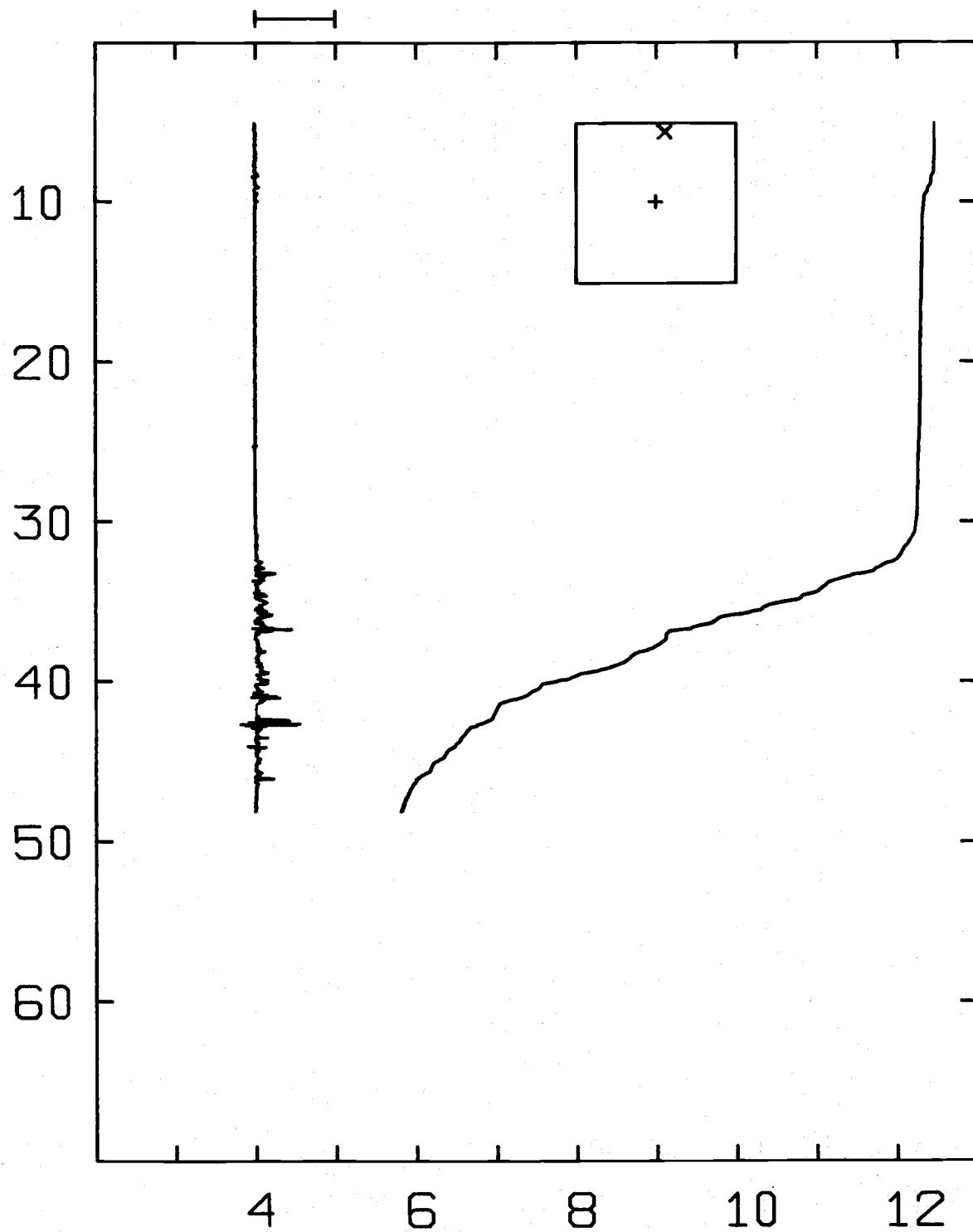
DATE 9/03/77

RANGE 4.23

TIME 0928

BEARING 189

10.0 DEG/M UNIT C P92B3



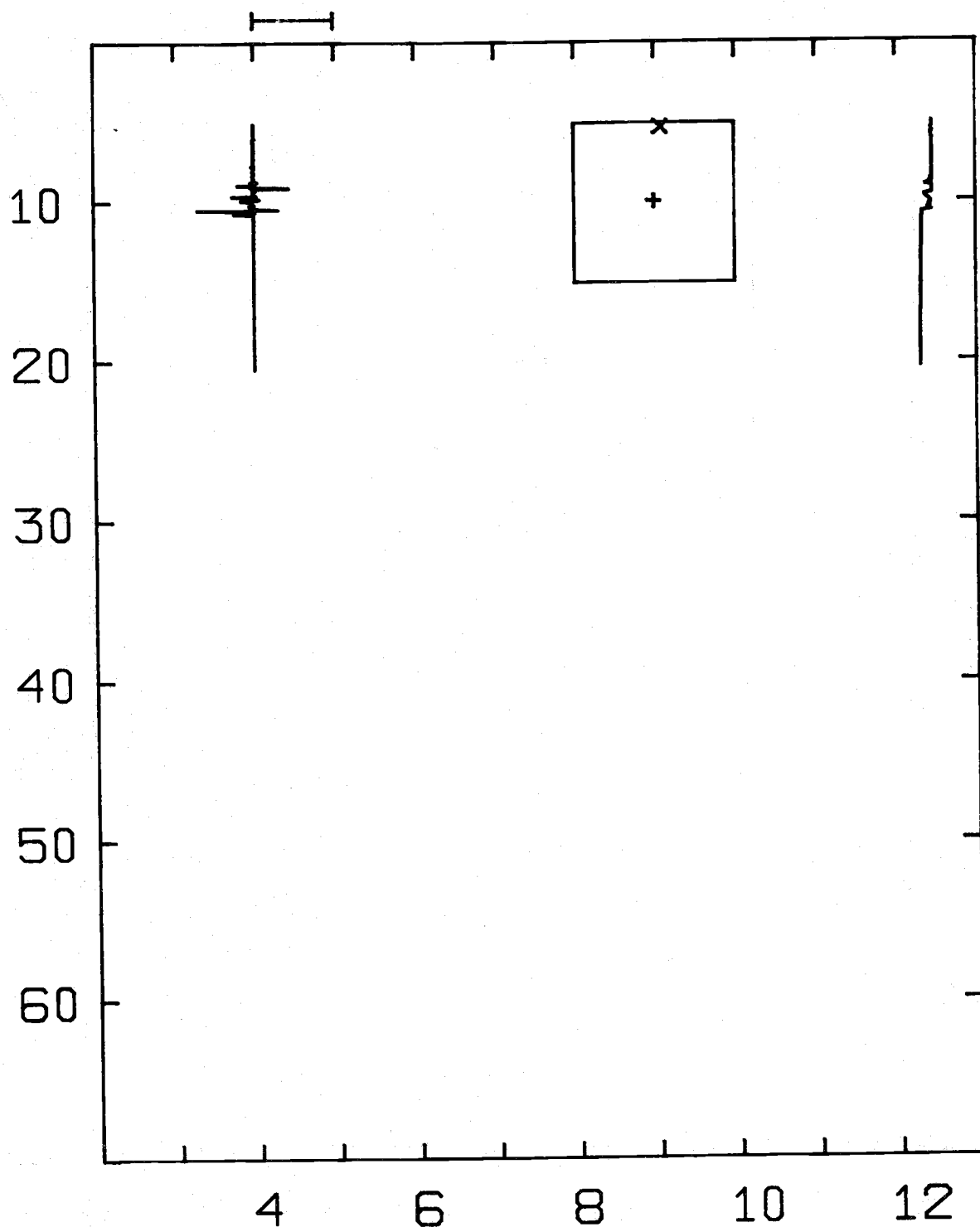
DATE 9/03/77

RANGE 4.48

TIME 0938

BEARING 187

30.0 DEG/M UNIT C P92B4



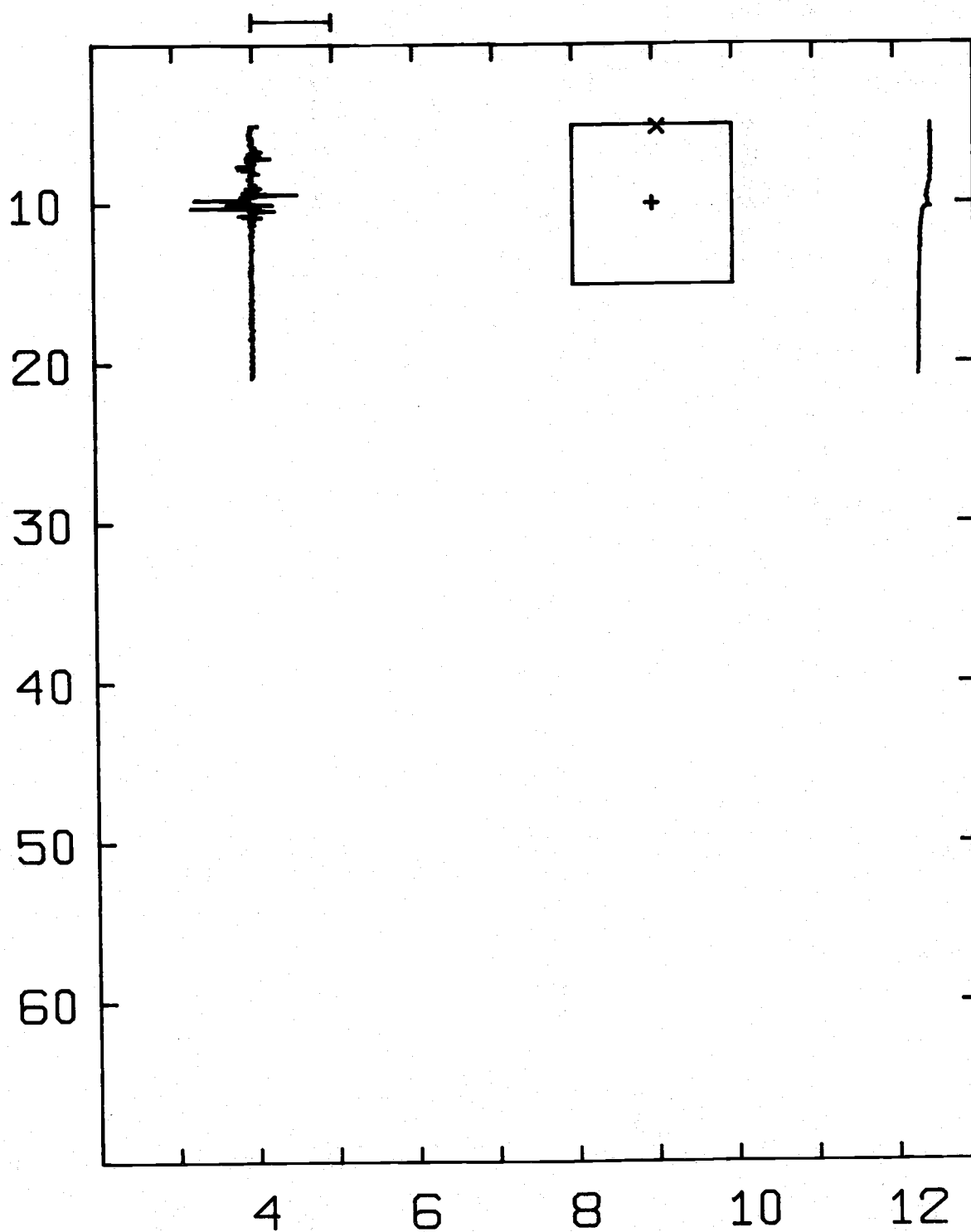
DATE 9/03/77

RANGE 4.74 .

TIME 0948

BEARING 185

3.00 DEG/M UNIT C P92B5



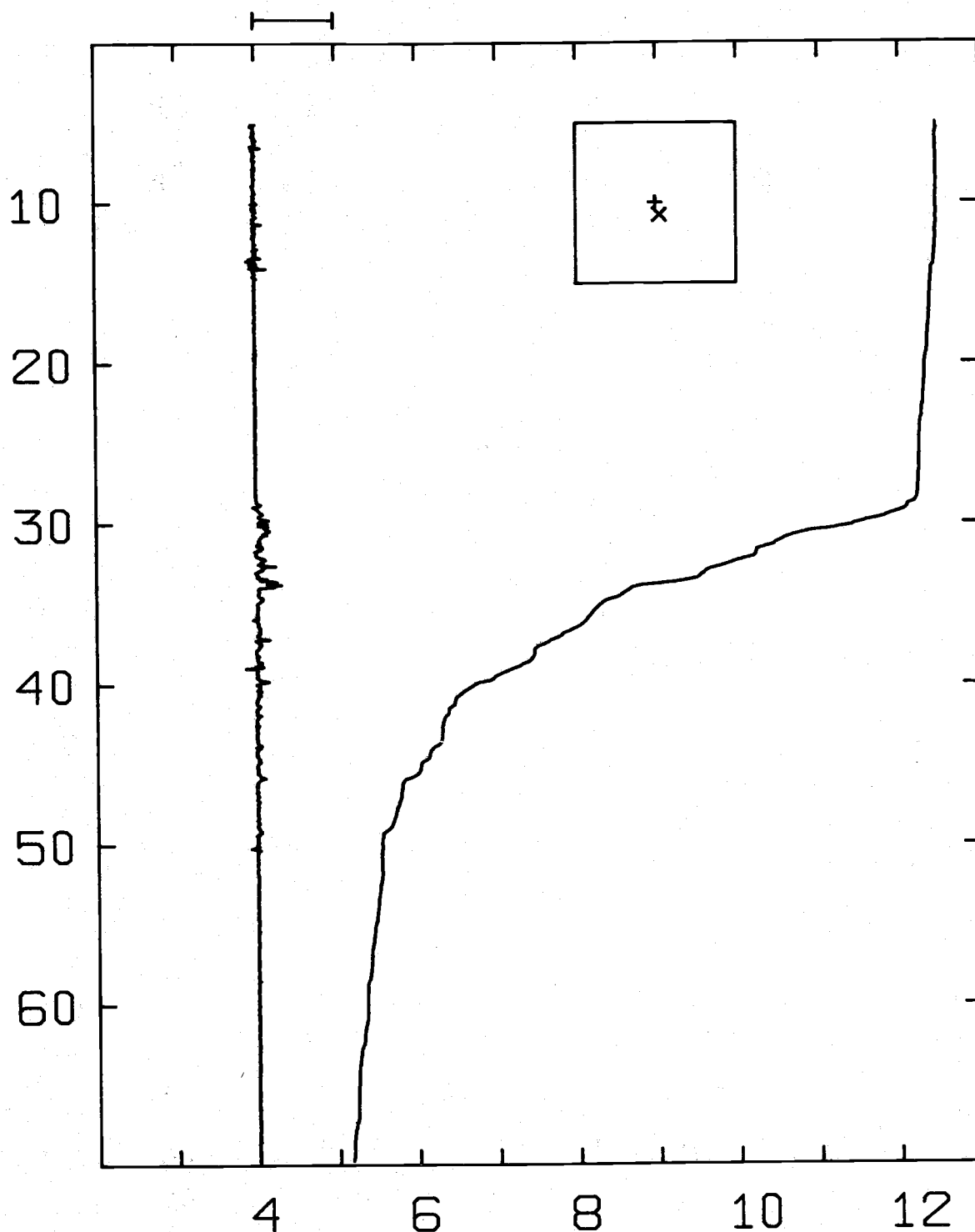
DATE 9/03/77

RANGE 4.86

TIME 0954

BEARING 184

10.0 DEG/M UNIT C P93A1



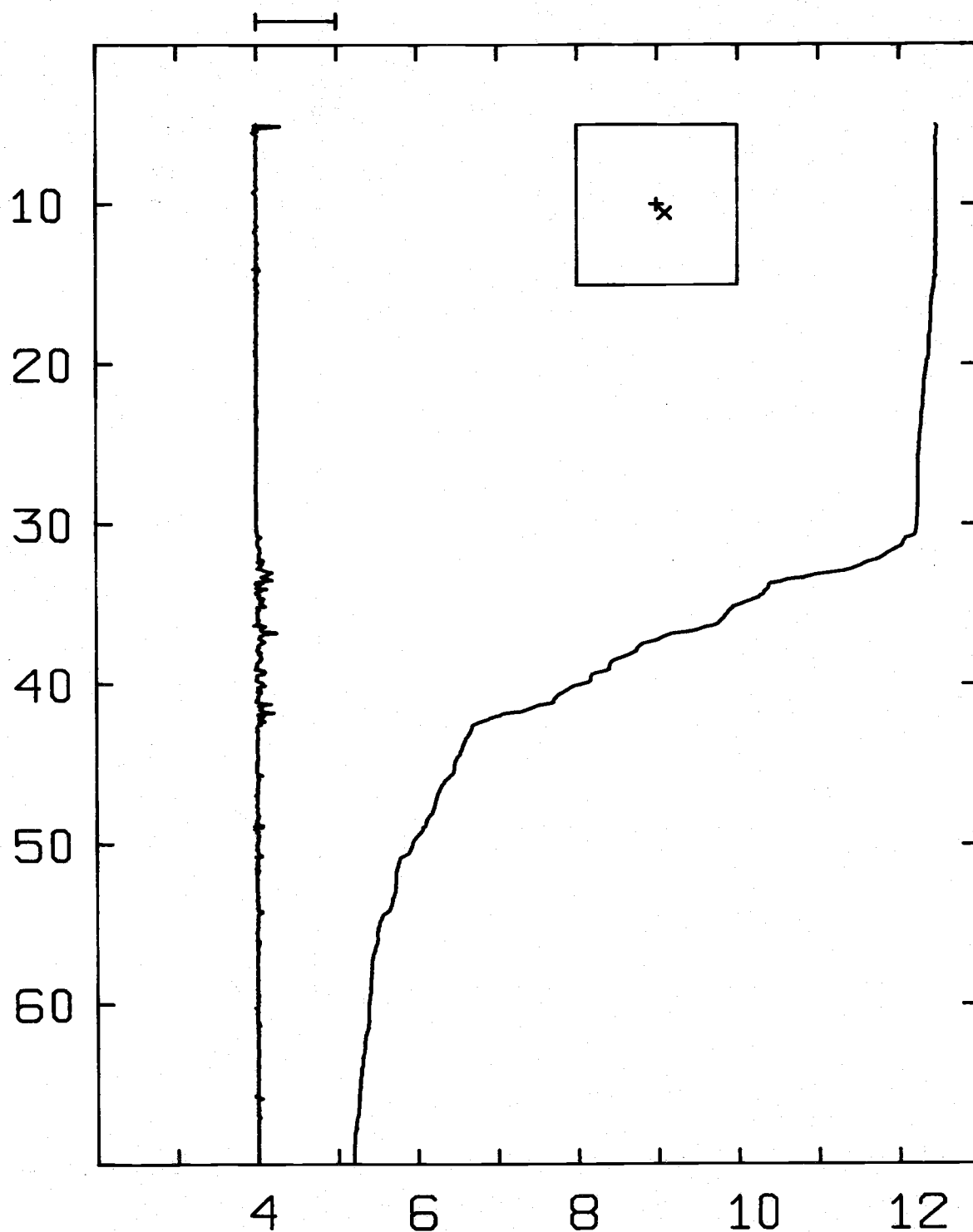
DATE 9/04/77

RANGE .834

TIME 0547

BEARING 343

10.0 DEG/M UNIT C P93A2



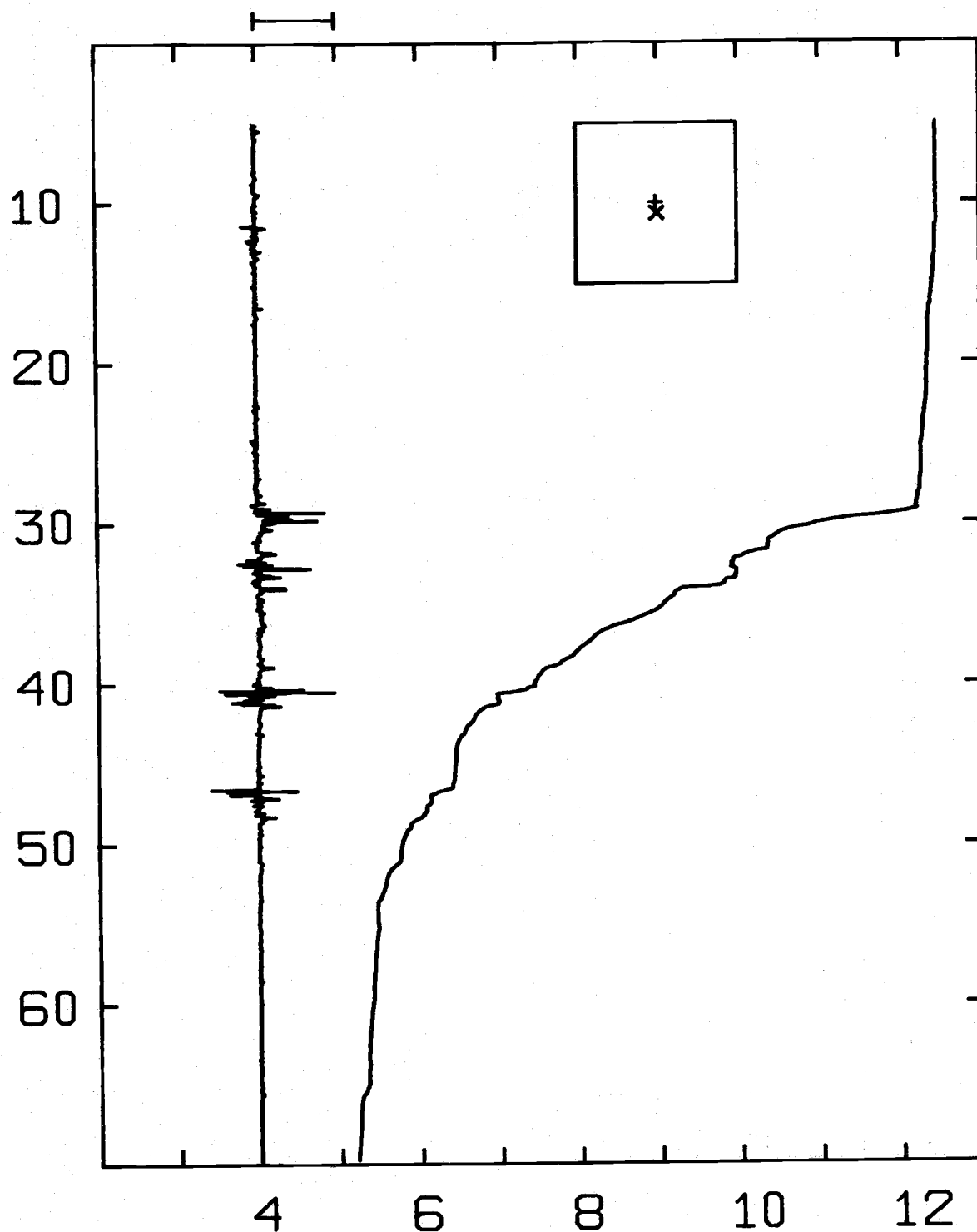
DATE 9/04/77

RANGE .741

TIME 0612

BEARING 318

10.0 DEG/M UNIT C P93A4



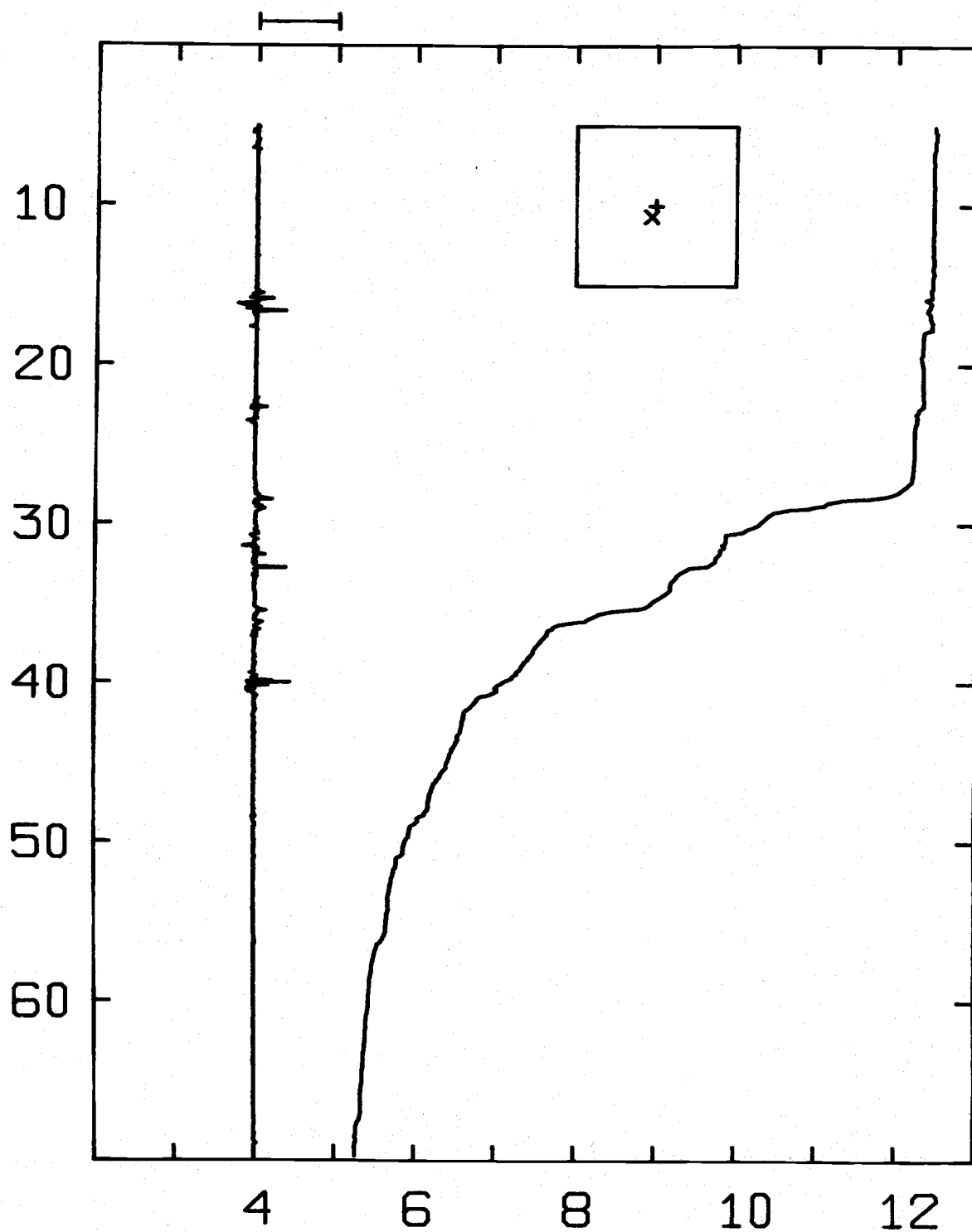
DATE 9/04/77

RANGE .686

TIME 0656

BEARING 355

10.0 DEG/M UNIT C P93A5



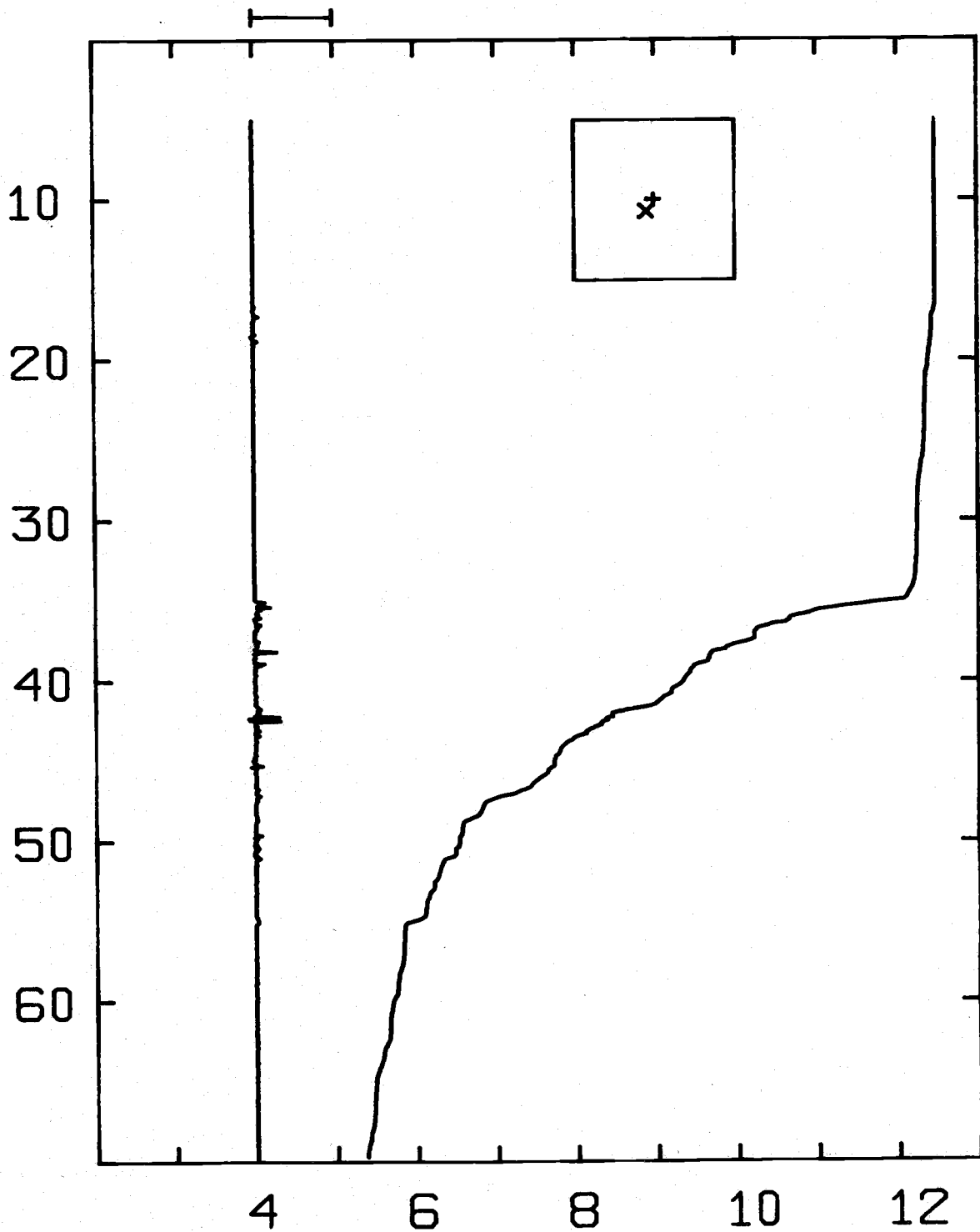
DATE 9/04/77

RANGE .741

TIME 0712

BEARING 24

10.0 DEG/M UNIT C P93B1



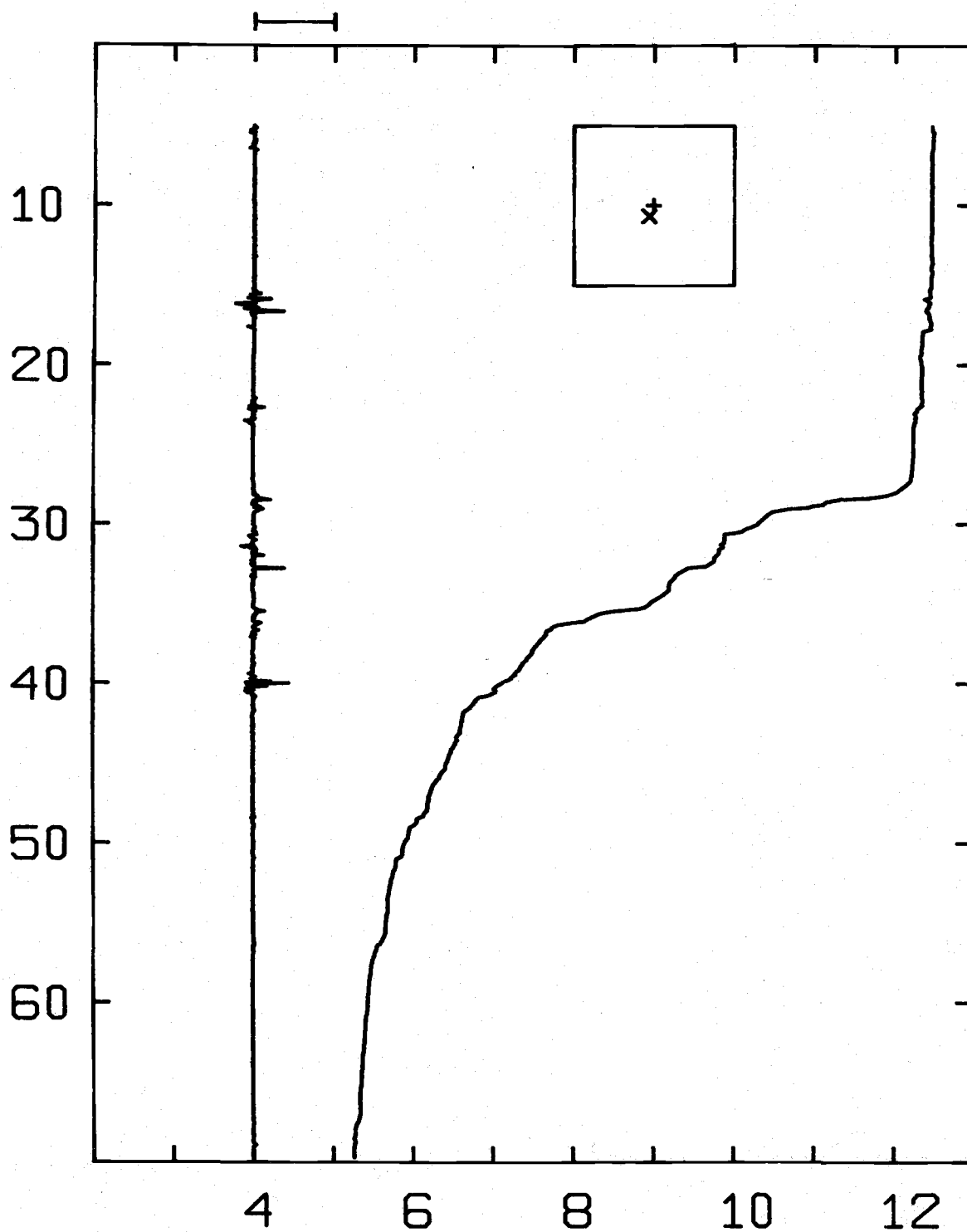
DATE 9/04/77

RANGE .890

TIME 0726

BEARING 32

10.0 DEG/M UNIT C P93A5



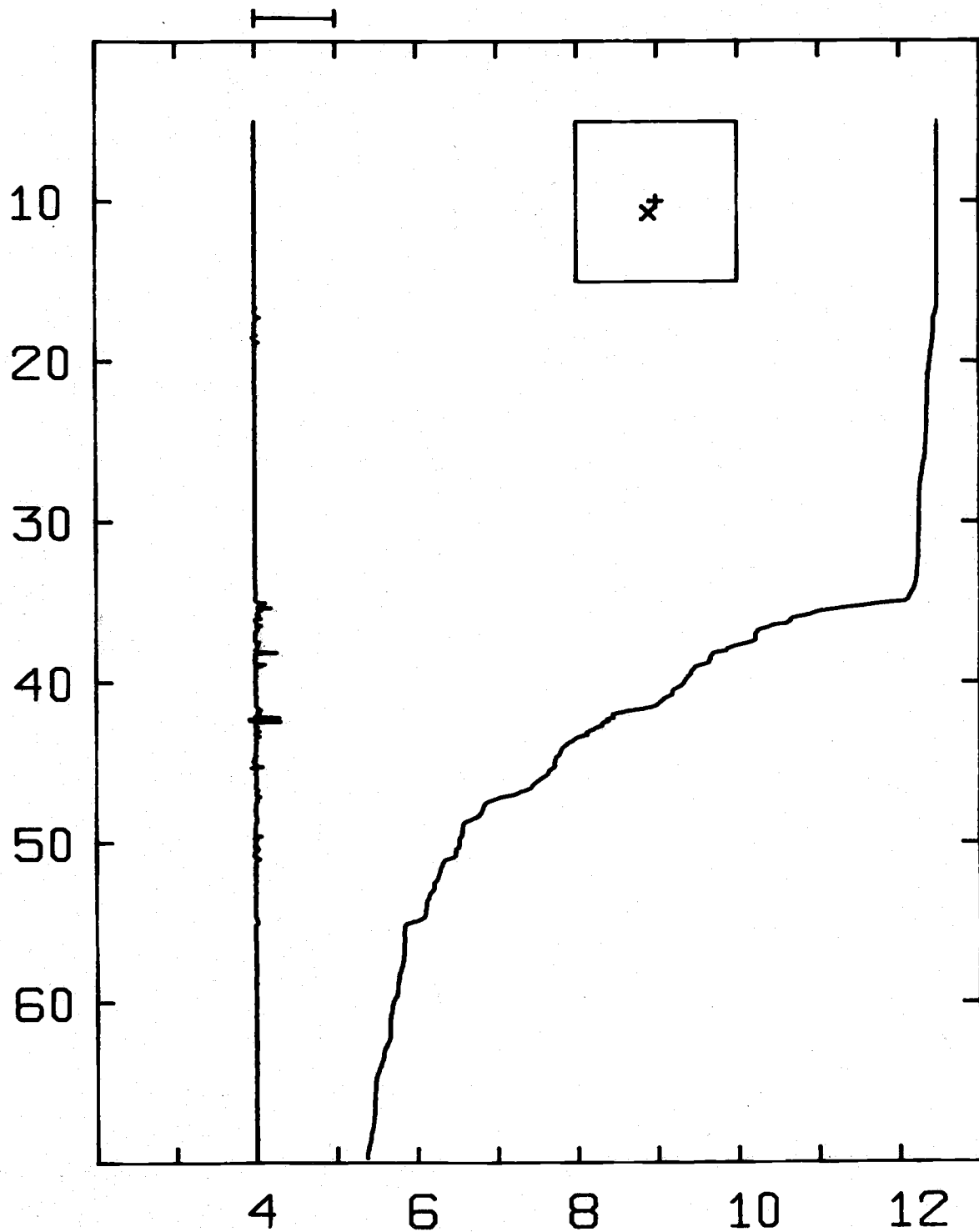
DATE 9/04/77

RANGE .741

TIME 0712

BEARING 24

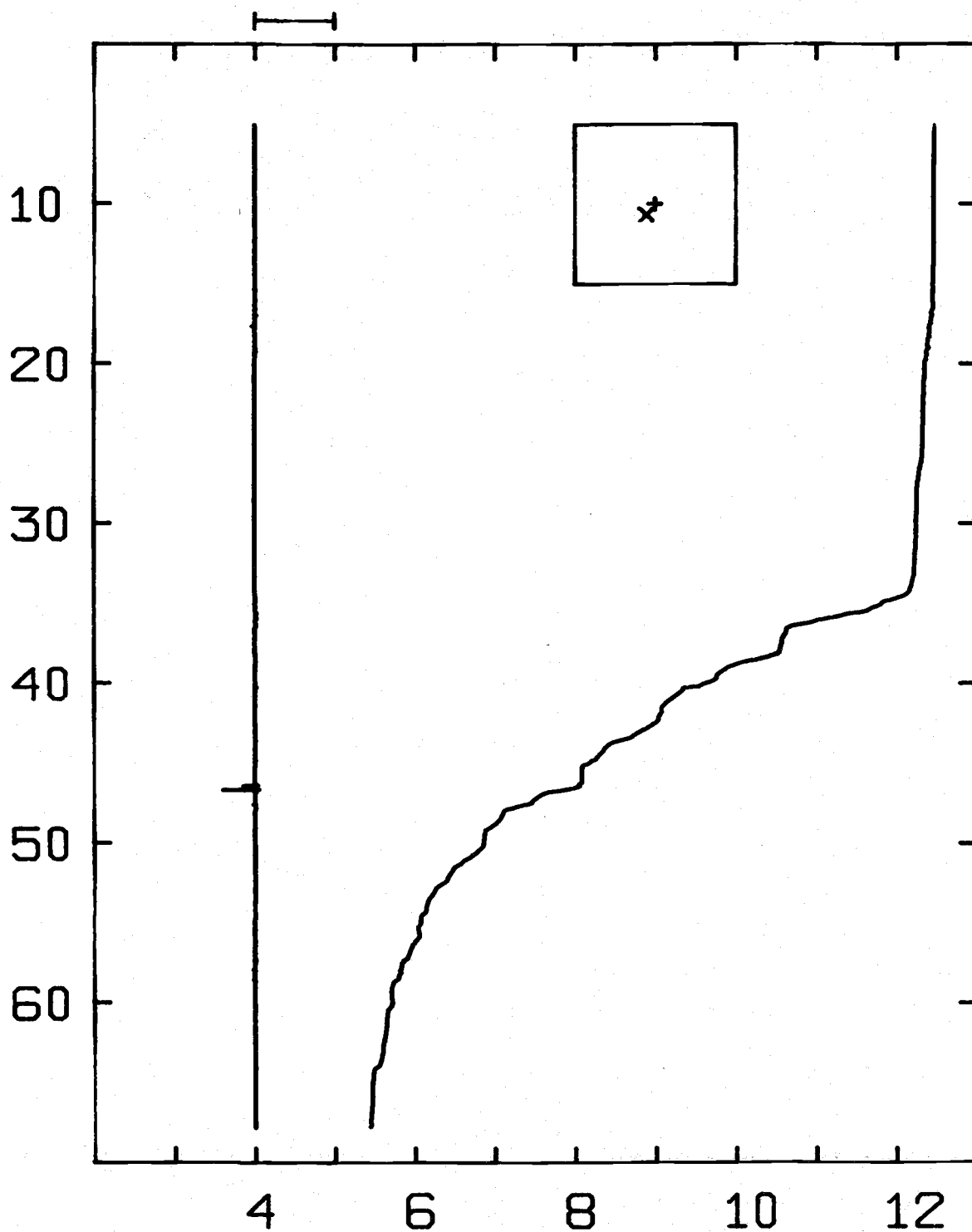
10.0 DEG/M UNIT C P93B1



DATE 9/04/77
TIME 0726

RANGE .890
BEARING 32

30.0 DEG/M UNIT C P93B2



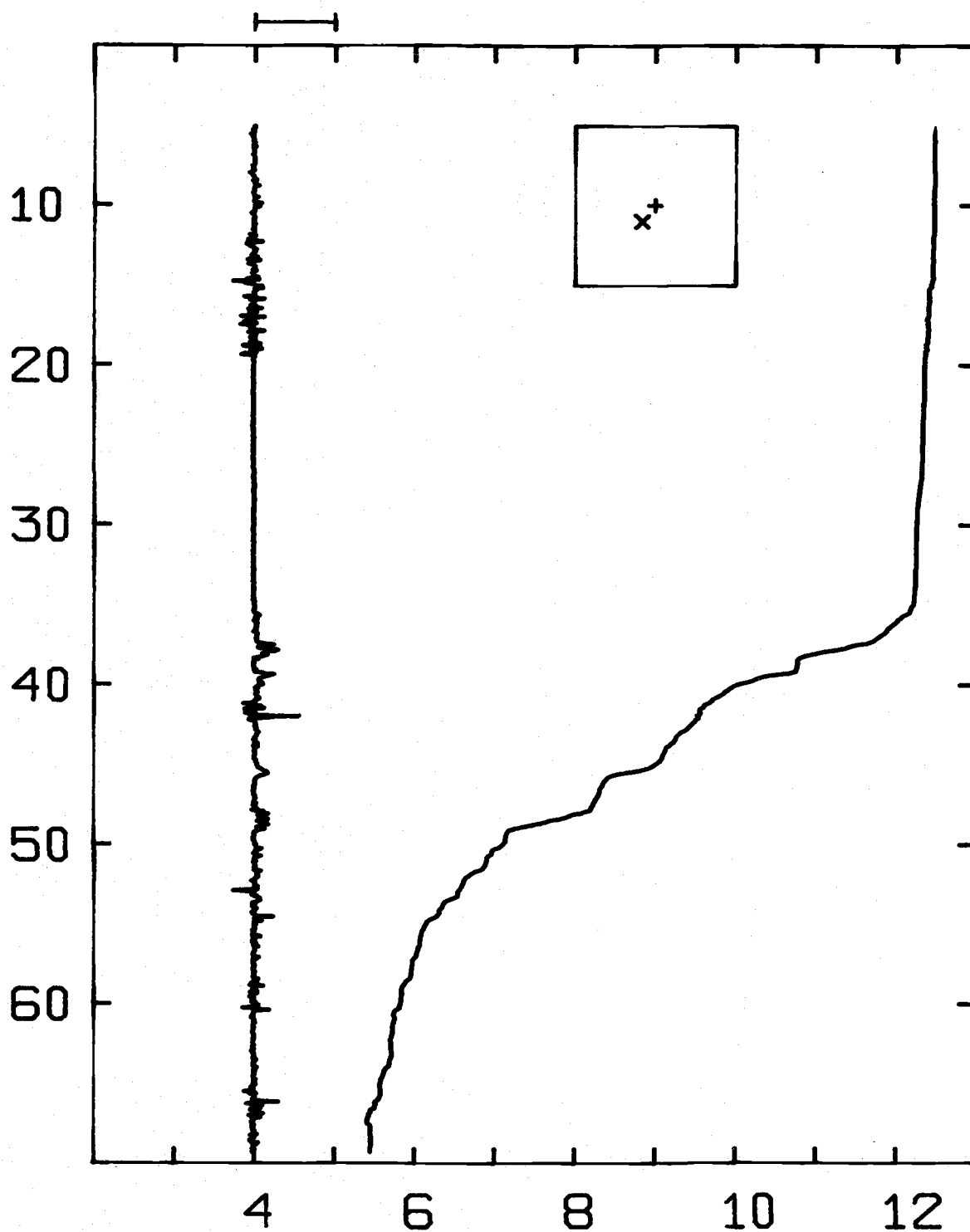
DATE 9/04/77

RANGE .890

TIME 0741

BEARING 40

3.00 DEG/M UNIT C P93B3



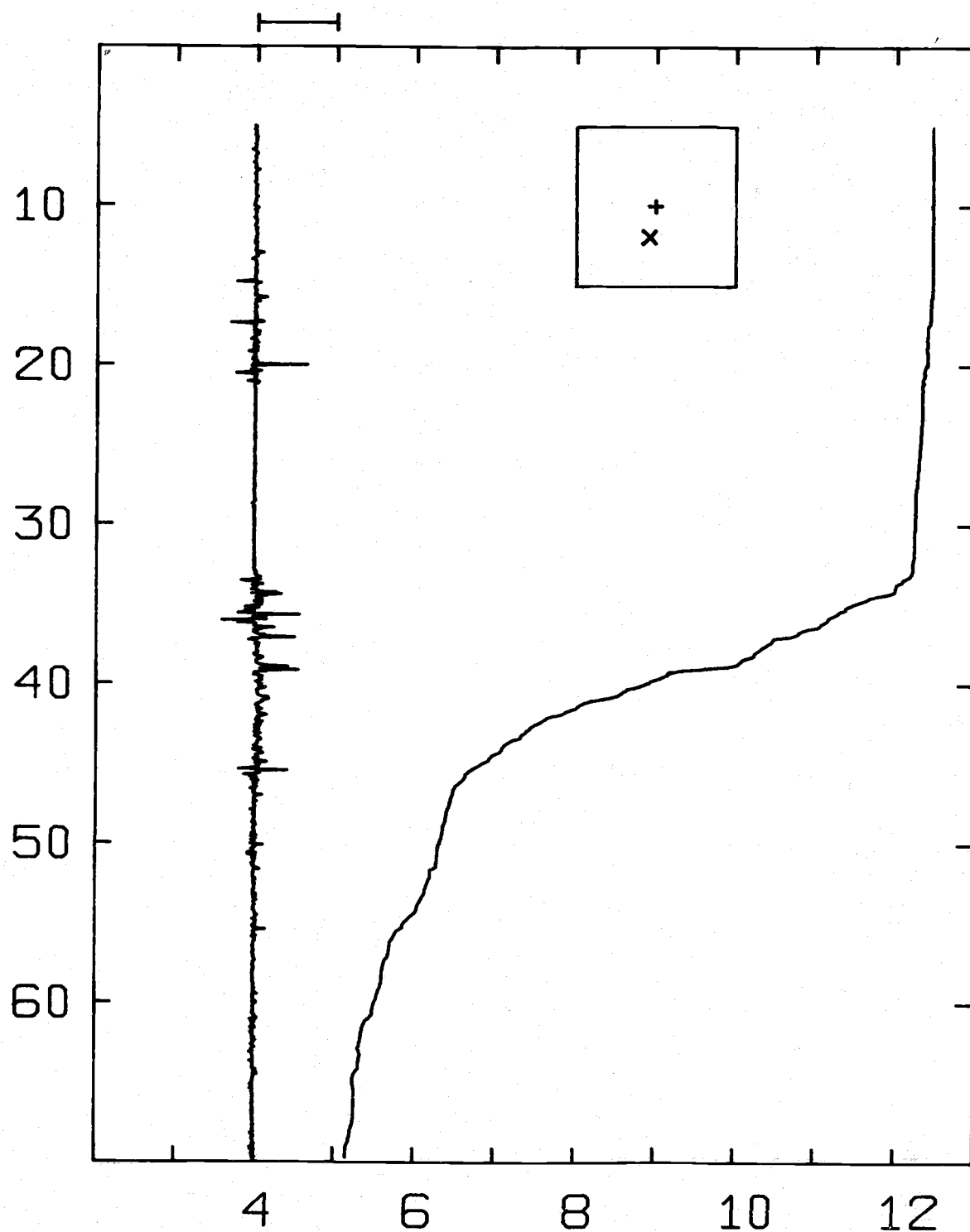
DATE 9/04/77

RANGE 1.30

TIME 0752

BEARING 40

3.00 DEG/M UNIT C P93B5



DATE 9/04/77

RANGE 2.00

TIME 0923

BEARING 12