

## SENDER LOAD INDICATING EQUIPMENT EQUIPMENT DESIGN REQUIREMENTS PANEL SYSTEMS

### 1. GENERAL

#### Scope

1.01 This specification, together with the supplementary information listed herein, covers the equipment design requirements for the equipment and circuits to be used in the engineering, manufacturing, and installation of sender load indicating equipment for use in panel system offices.

1.02 This specification is reissued to incorporate previous appendix changes and to change the rating from "AT&TCo Standard" to "A&M Only."

#### Capacity

1.03 One set of sender load indicating equipment is required for each group of subscriber senders. The sizes of the sender groups are not affected by the use of sender load indicating equipment.

#### Description

1.04 Sender load indicating equipment provides a continuous visual indication of the number of idle subscriber senders in a group. It also is arranged to operate a register once each second that a load, in excess of a fixed percentage (80 or 90 per cent), of the senders of a group is busy or plugged out of service. When this condition occurs, audible and visual alarms are actuated at various places such as the sender make busy frame, DSA switchboard, trouble desk, and the floor and main alarm boards.

1.05 The scale of a milliammeter is calibrated to show the number of idle senders still available for service. The purpose of this meter is to assist in regulating the sender load, particularly when taking out of service or placing back in service certain lines by means of the line load equipment. This meter shall be located as directed by the Telephone Company. However, when this meter is to be mounted on a frame or column, it shall be located at eye level and not more than five and one-half feet from the floor. Typical locations are listed below.

- (a) In or near the line load control cabinet when line load control equipment is furnished.
- (b) In or near the sender make busy frame on jobs with DSA board moni-

toring or on jobs without a DSA switchboard and no line load equipment.

- (c) On or near the trouble desk on jobs with trouble desk monitoring and no line load control equipment.

1.06 Two arrangements for providing sender load indications are provided depending upon whether a make or break contact is used on the sender busy relay in the associated sender circuits.

1.07 The make contact or series type of sender load indicating equipment requires the addition of a small 25-ohm shunt resistance mounted directly across the make contact of the SB relay formerly used for the "all sender busy register" feature in the subscriber sender.

1.08 The break contact or parallel type of sender load indicating equipment will also require a resistance per subscriber sender, but this resistance shall be located on the relay rack near the sender load equipment. These resistances are wired to the break contact of the SB relay formerly used for the "all senders busy" register circuit.

1.09 Subscriber sender groups with both the break and make contact type of senders in the same group will require a relay for each sender that uses a make contact to indicate a busy condition in addition to the resistance described in paragraph 1.07. The purpose of this added relay is to convert the make contact in the sender to a break contact in order that all of the senders in one group can be handled as described in paragraph 1.08.

1.10 Visual signals are provided at the sender make busy frame and DSA switchboard or trouble desk per subscriber sender group, and common audible and visual signals are provided at the sender make busy frame (aisle pilot) DSA switchboard, trouble desk, and floor or main alarm board, per floor. The sender load indicating circuit is arranged so that the signals are given when 80 per cent or more of the senders are busy, as in the case of a large group of sender selector type senders (used with a sender grouping frame), or 90 per cent or more for all other types of subscriber sender groups.

1.11 The all senders busy register will not be required when the sender load indicating feature is furnished. The sender group busy alarms in sender selector type jobs may be reused as described under the headings "Trouble Desk", "DSA

Switchboard", "Sender Make Busy Frame", and "Miscellaneous Alarms". The sender group busy alarm in link type offices will not be required and may be removed when the sender load indicating alarms are furnished. The link down drive alarms and registers may be reused as described under the headings "Traffic Register Rack", "Sender Make Busy Frame", "Trouble Desk", and "Miscellaneous Alarms".

- J21801 (815-036-150) - Sender Make Busy Frame
- J22601 (AA220.006) - Traffic Register Rack
- J27002 (815-200-154) - Sender Grouping Frame
- J28301 (AA227.802) - Floor Alarm Board
- J91103 (815-075-150) - DSA Switchboard
- J91104 (815-075-152) - DSA Switchboard Relay Rack Equipment
- J99230 (815-007-152) - Line Load Control Equipment

**2. SUPPLEMENTARY INFORMATION**

- 815-000-000 - Panel Systems Index
- AA128.006 - List of General Equipment Requirements Sections
- X-61200 - List of Engineering Requirement Sections for Offices Having Ground on the C.O. Relays
- X-61400 - List of Engineering Requirement Sections for Offices Having Battery on the C.O. Relays

**3. DRAWINGS**

Keysheets - Panel Systems

- SD-21300-01 - Link Type - B.C.O. Offices
- SD-21680-01 - Link Type - G.C.O. Offices
- ES-262532 - Sdr. Sel. Type - 3 Digit
- ES-262647 - Sdr. Sel. Type - 2 & 2-3 Digit

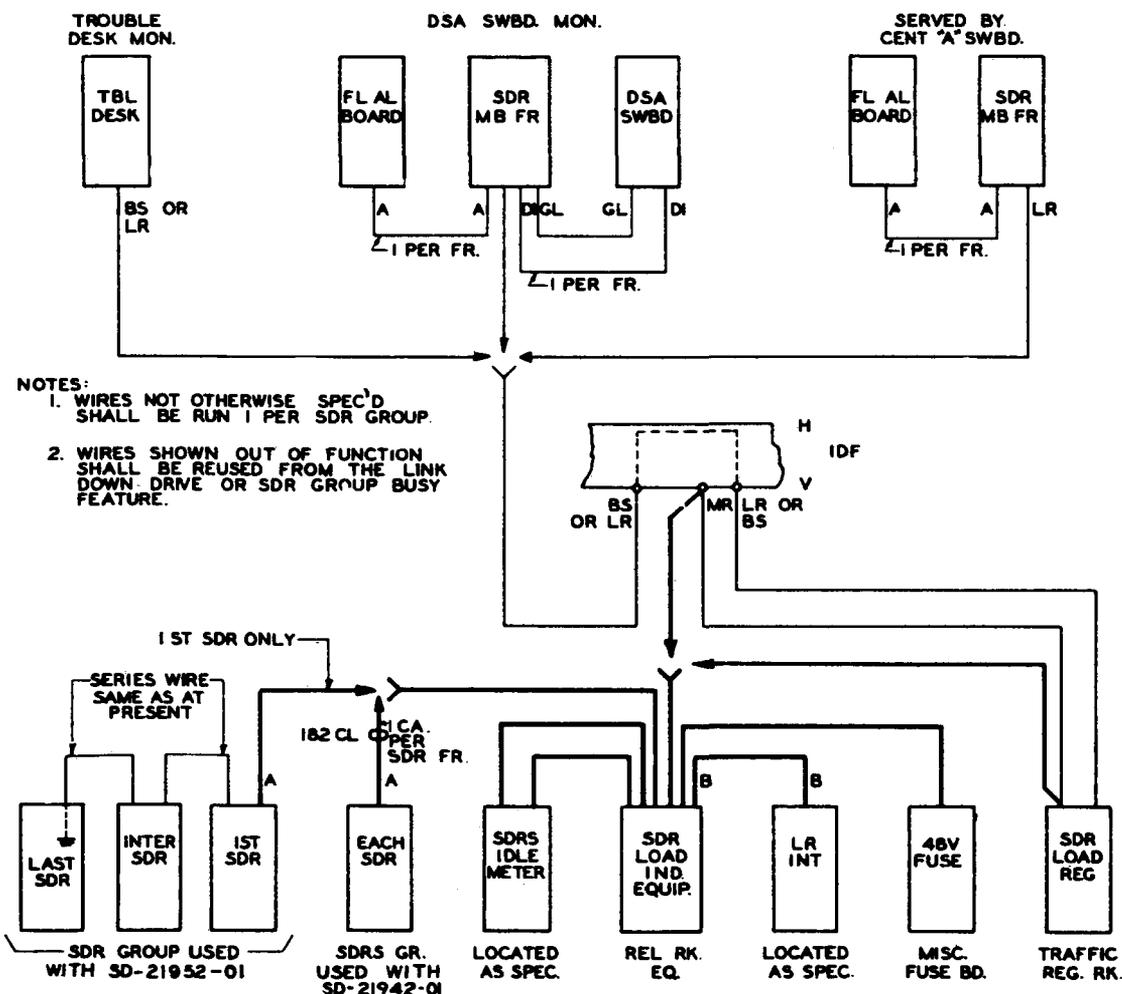


Fig. 1 - Diagram of Connections for the Sender Load Indicating Feature

Alarm Circuits

ES-20021-01 - Sdr. Load Alarm - DSA Board Mon. - Sdr. Sel. Type  
 SD-20141-01 - Misc. Register Circuit - 24-volt Type  
 ES-20241-01 - Misc. Alarm Circuit - 48 Volts - Link Type  
 ES-20308-01 - Sdr. Load Alarm - Trouble Desk Mon.  
 ES-20400-01 - Sdr. Load Alarm - Trouble Desk Mon.  
 SD-21127-01 - Misc. Register Circuit - 48-volt Type  
 SD-21201-01 - Misc. Time Alarm - B.C.O. Offices  
 SD-21203-01 - Misc. Alarm Signals - B.C.O. Offices  
 SD-21236-01 - Misc. Circuit for Sdr. M.B. Frame - With DSA Swbd.  
 SD-21275-01 - Sdr. Load Alarm - DSA Board Mon. - Decoder Type  
 SD-21318-01 - Floor Alarm Circuit (Fig. 6 Only)  
 SD-21478-01 - Sdr. Load Alarm - DSA Board Mon. - Link Type  
 SD-21479-01 - Sdr. Load Alarm - Link Type Trouble Desk Mon.  
 SD-21537-01 - Misc. Register Circuit - 48-volt Type  
 SD-21663-01 - Misc. Circuit for Sdr. M.B. Frame - Without DSA Swbd.  
 SD-21666-01 - Misc. Interrupter Circuit  
 SD-21942-01 - Sender Load Indicating Circuit - Break Contact Type  
 SD-21952-01 - Sender Load Indicating Circuit - Make Contact Type  
 SD-90464-01 - Aux. Signal Circuit - DSA Swbd.  
 ES-226102 - Misc. Alarm Circuit - 24 Volts - Sdr. Sel. Type  
 ES-226189 - Misc. Alarm Circuit - 24 Volts - Sdr. Sel. Type  
 ES-240098 - Sdr. Load Alarm - Trouble Desk Mon. - Sdr. Sel. Type

Sender Circuits

SD-20008-01 - 2-3 Digit - Noncoin  
 SD-20009-01 - 2-3 Digit - Coin  
 SD-20011-01 - 3 Digit - Link Type - Noncoin  
 SD-20011-02 - 3 Digit - Link Type - Mod. of SD-20011-01 for Use with Decoders  
 SD-20012-01 - 3 Digit - Link Type - Coin  
 SD-20012-02 - 3 Digit - Link Type - Mod. of SD-20012-01 for Use with Decoders  
 SD-20028-01 - 3 Digit - Line Fdr. Type - Unit Type  
 SD-20028-02 - 3 Digit - Line Fdr. Type - Mod. of SD-20028-01 for Use with Decoders  
 SD-20082-01 - 2 Digit - Noncoin  
 SD-20083-01 - 2 Digit - Coin  
 ES-20559-01 - 2 Digit - Sdr. Sel. Type - Atlanta, Ga. Only  
 SD-21001-01 - 3-2 Digit - Noncoin  
 SD-21002-01 - 3-2 Digit - Coin  
 SD-21193-01 - Decoder Type - Noncoin - Link Type  
 SD-21193-02 - Decoder Type - Noncoin - Sdr. Sel. Type

SD-21193-05 - Decoder Type - Noncoin - Timed Release Type  
 SD-21194-01 - Decoder Type - Coin - Link Type  
 SD-21359-01 - 2 Digit - Link Type - Atlanta, Ga. Only  
 SD-21826-01 - 3 Digit - Mod. of ES-240067 for Use With Decoders  
 SD-21839-01 - 3 Digit - Mod. of ES-240051 for Use With Decoders  
 SD-21840-01 - 3 Digit - Mod. of ES-240053 for Use with Decoders  
 ES-226610 - 2 Digit - Sdr. Sel. Type  
 ES-239725 - 2-3 Digit - Sdr. Sel. Type - Noncoin  
 ES-240051 - 3 Digit - Line Switch Type  
 ES-240053 - 3 Digit - Line Fdr. Type - Nonunit Type  
 ES-240067 - 3 Digit - Line Fdr. Type - Nonunit and Unit Type

Equipment

ED-20122-01 - Sdr. Make Busy Frame  
 ED-20122-02 - Sdr. Make Busy Frame - Without "A" Bd.  
 ED-20122-03 - Sdr. Make Busy Frame - With "A" Bd.  
 ED-20171-01)  
 ED-20171-02) - Traffic Reg. Rack - 48-volt Type  
 ED-20171-03)  
 ED-20171-04)  
 ED-20202-01 - Floor Alm. Bd. Frame Equipment  
 ED-20405-01 - Floor Alm. Bd. Equipment Details  
 ED-21666-01 - Misc. Interrupter Frame Equipment  
 ED-21942-01 - Sender Load Ind. Equipment  
 ED-91391-01 - DSA Swbd. Equipment Details  
 ED-91803-01 - Line Load Control Cabinet Equipment  
 ES-299825 - Traffic Reg. Rack - 24-volt Type

4. GENERAL NOTES

4.01 One set of sender load indicating equipment shall be furnished for each subscriber sender group. This equipment consists of one or more plates of equipment mounted on the relay rack and wired by the installer (See ED-91942-01), plus a meter and associated alarm and register apparatus as follows.

4.02 A Western Electric Company milliammeter (code G2F for the series type and a code G2G for the parallel type) shall be furnished and mounted as directed by the Telephone Company. However, when this meter is to be mounted on a frame or column, it shall be located at eye level and not more than five and one-half feet from the floor. Typical locations are listed below.

(a) In the line load control cabinet per ED-91803-01, when line load control equipment is furnished. These meters shall be mounted on available jack spaces on a job basis.

(b) In the sender make busy frame per ED-20122-01, -02, or -03 when the sender monitoring is done at the DSA switchboard, or at the sender make busy frame in an office without line load control equipment. These meters shall be mounted on available jack spaces on a job basis. If a jack space is not available, they shall be mounted to the right of the right-hand upright, by means of angle brackets.

(c) In the trouble desk on jobs where the sender monitoring is done at the trouble desk and no line load control equipment is specified. This meter shall be located in a spare jack space on a job basis.

#### Senders and Sender Load Equipment

4.03 The make or break contact of the SB relay in the various types of subscriber senders now used for the "All Senders Busy" register circuit may be reused as described below.

4.04 Senders that use a make contact on the SB relay in the subscriber senders, to indicate a busy condition, will require an added 106A resistance SB of 25 ohms soldered directly to the wiring side of these relay contact springs on the SB relay. The existing series path thru the SB relay make contacts shall be reused except on those jobs where this path now runs to the DPTS for connections between frames. On this type of job, it will be necessary to cut this wire dead and wire between sender frames directly from frame terminal strip to frame terminal strip in order to reduce the resistance in the series path to the senders idle meter. Sender load indicating resistances A and B shall be furnished as required depending upon the number of senders in the group, and resistances D, E, F, G, and H shall be strapped as required depending upon the amount of resistance in the series path thru the meter, as covered by the tables and notes on SD-21952-01, in order to give a correct reading on the "Senders Idle" meter (reference ED-21942-01, Fig. 2).

4.05 Senders that use a break contact on the SB relay in the subscriber senders, to indicate a busy condition, will require an 18FN resistance LR per sender. This resistance shall be located on the relay rack with the rest of the sender load equipment (see ED-21942-01, Fig. 1). Resistances A, B, and C shall be furnished, as required, depending upon the number of senders in the group, and resistances E, F, and G shall be strapped, as required, depending upon the resistance of the leads from the sender, as covered by the tables and notes on SD-21942-01, in order to give a correct reading of the "Sender Idle" meter.

4.06 Sender groups that contain both of the above types of senders will require an added relay SB for each of the senders that use a make contact on the sender SB relay to indicate a busy condition. This added relay shall be located on the relay rack with the rest of the sender load equipment (see ED-21942-01, Fig. 1). The purpose of this added SB relay is to convert the make circuit into a break circuit, so that all the senders in the combined group can be cared for as described in paragraph 4.05.

#### Interrupter

4.07 An LR interrupter per SD-21666-01, Fig. 128, shall be located on the miscellaneous interrupter frame per ED-21666-01, the desk sender frame, or any other frame where interrupter space is available, or where there are spare interrupter contacts on an interrupter with the right make and break intervals. The purpose of this interrupter is to operate the sender load register once each second that the busy condition exists. When modifying the sender load register circuit SD-21937-01 to the sender load indicating feature per SD-21942-01 or SD-21952-01, the LR interrupter may be reused.

#### Sender Make Busy Frame

4.08 Sender load indicating alarm equipment located on the sender make busy frame in link type offices consists of a GL lamp, GL and SW relays, and a B resistance per SD-21236-01, Figs. 10 and 19, per sender group. This equipment is operated by the sender load register circuit, and is locked under a common release key per SD-21236-01, Fig. 11. An aisle pilot lamp is also provided, per frame, as shown on SD-21236-01, Fig. 12.

4.09 This alarm equipment is the same as that furnished for the link down drive feature per SD-21478-01 or SD-21236-01, and it shall be reused without change for the sender load indicating alarms. Some of the existing jobs do not provide the SE relay and B resistance, but do provide a lead to the GLA lamp in the DSA switchboard. This equipment shall also be reused without change, unless otherwise requested by the telephone company. The aisle pilot shall only be provided in offices that are arranged for aisle pilots. (Reference ED-20122-01 or ED-20122-03).

4.10 Sender load indicating alarms on sender make busy frames, arranged to work in offices with a DSA switchboard centralized in a remote building, are similar to that described in paragraph 4.08, except that this type of equipment does not require any alarms at the central

"A" switchboard. This equipment shall be furnished per SD-21663-01, Figs. 4, 13, and 14. (Reference ED-20122-02).

4.11 Sender group busy alarm equipment now installed per ES-20021-01 or SD-21275-01 shall be reused for the sender load indicating feature. The time feature in this circuit and the connections to the auxiliary make busy circuit (ES-20089-01) shall be removed when associated with sender groups that work with sender group-frames.

4.12 The "LR" or "BS" leads on any of the above circuits shall be connected to a register circuit per SD-20141-01, Fig. 16, SD-21127-01, Fig. 13, or SD-21537-01, Fig. 13.

#### Traffic Register Rack

4.13 The register rack equipment associated with the sender load indicating feature consists of two relays, L and LR, and a register which operates once every second that 90 per cent or more of the subscriber senders in a group are either busy or plugged out of service. An exception of this is made when the senders are associated with the sender grouping frames, in which case the register operates once per second when 80 per cent or more of the senders are busy or plugged out of service. This equipment shall be wired and equipped per SD-20141-01, Fig. 16, for jobs that employ 24-volt registers, and SD-21127-01, Fig. 13, or SD-21537-01, Fig. 13, for jobs that use 48-volt registers.

4.14 Registers now employed for the link down drive feature per these drawings shall be reused without change. Link down drive registers now installed per SD-20141-01, Fig. 12, SD-21127-01, Fig. 12, or SD-21537-01, Fig. 12, or similar circuits, shall be modified to agree with the circuits listed in paragraph 4.13.

4.15 "All senders busy registers" per SD-20141-01, Fig. 7, or similar circuit in sender selector jobs, shall be modified to agree with SD-20141-01, Fig. 16, in order to function with the sender load indicating equipment. All senders busy registers furnished on link jobs that are equipped with the link down drive register shall be removed as they will no longer be required.

4.16 The "LS" or "BS" leads shown on SD-20141-01, Fig. 16, or the "LR" lead per SD-21127-01, Fig. 13, or SD-21537-01, Fig. 13, shall be connected in accordance with the following:

- (a) Lead "LR" shall be connected to SD-21236-01 at the sender make busy frame for B.C.O. jobs with DSA board monitoring.

- (b) Lead "LR" shall be connected to SD-21663-01 at the sender make busy frame for jobs served by a remote central "A" switchboard.

- (c) Lead "LR" shall be connected to SD-21478-01 at the sender make busy frame for G.C.O. jobs with DSA board monitoring.

- (d) Lead "BS" shall be connected to existing equipment per ES-20021-01 or SD-21275-01 at the sender make busy frame in sender selector type offices with DSA board monitoring.

- (e) Lead "BS" shall be connected to existing equipment per ES-240098, ES-20308-01, or ES-20400-01 at the trouble desk in sender selector type offices.

- (f) Lead "LR" shall be connected to SD-21479-01 at the trouble desk for G.C.O. offices with link equipment and trouble desk monitoring.

#### DSA Switchboard

4.17 Sender load indicating alarms are required in the DSA switchboard when the sender monitoring is done at the DSA switchboard. This equipment consists of a sender load lamp GLA per SD-90464-01, Fig. 15, per sender group, a common busy lamp BY, and a key AL RKL connected to auxiliary relays AX and SP per Figs. 12 and 18 of SD-90464-01. The auxiliary relays shall be mounted on the relay rack and the lamps and key located on the DSA switchboard as shown on ED-91391-01, Figs. A13, S7, and P.

4.18 The equipment described in paragraph 4.17 is the same as that now furnished on many of the existing jobs for the sender group busy alarms for sender selector or link down drive alarm, and shall be reused without change. Certain of the earlier jobs only provided a GLA lamp per ES-20021-01 or SD-21275-01 for sender selector jobs, or SD-21479-01 or SD-21236-01 for link jobs. This lamp shall be reused in place of the equipment described in paragraph 4.17 on these jobs, unless otherwise specified by the Telephone Company. Additional sender groups shall use the same circuits as those now installed.

#### Trouble Desk

4.19 The sender group busy alarms per ES-240098, ES-20308-01, or ES-20400-01, or link down drive alarms per SD-21479-01, now installed at the trouble desk, shall be reused for the sender load indicating alarm feature. This equipment consists of a sender group lamp GROUP and relay GL per sender group, which operate

whenever the associated register circuit is operated. This equipment in turn operates a common lamp pilot and relay SAB, SA, or GA and locks up thru the alarm release key. This latter relay also operates a bell at the trouble desk. Additional GROUP lamps and GL relays will be required for each added sender group installed. It is not expected that any additional pilot lamps, release keys, or the common relay will be required as they would only be required when adding a new lineup of trouble desk.

4.20 Sender selector groups of 22 or less senders shall continue to use the time interval feature shown on ES-20400-01 as well as the auxiliary make busy circuit which connects in the ground lead to the (SA) relay or release key. However, on sender selector type sender groups used with sender grouping frames, the time feature in this circuit and the connections to the auxiliary make busy circuit cannot be used and shall, therefore, be removed.

4.21 The "ES" lead for sender selector type jobs shall be connected to the sender load indicating register circuit SD-20141-01, Fig. 16, instead of the "all senders busy register" circuit. The "LR" lead on link-type jobs which now connects to SD-20141-01, Fig. 16, shall be reused without change. These alarms will not function with link down registers per SD-20141-01, Fig. 12.

#### Miscellaneous Alarms

4.22 The common relay GA used to operate the floor FGA and main alarm board lamp GA and the aisle pilot lamp GB when required, now installed for the sender group busy alarm feature, shall be reused without change for the sender load indicating floor and main alarm board signals. The following is a list of

these circuits with the associated audible alarm circuit:

#### G.C.O. Offices Without Aisle Pilots

ES-20021-01, Fig. 2, for Sender Selector Jobs  
 SD-20241-01 Audible Alarms - Link Jobs  
 SD-21478-01, Fig. A, for Link Jobs  
 ES-226102 or ES-226189 Audible Alarms - Sender Selector Jobs

#### G.C.O. Office with Aisle Pilots

ES-20021-01, Fig. 3, for Sender Selector Jobs  
 SD-20241-01 Audible Alarms - Link Jobs  
 SD-21478-01, Fig. B, for Link Jobs  
 ES-226102 or ES-226189 Audible Alarms - Sender Selector Jobs

#### B.C.O. Office

SD-21203-01, Audible Alarms  
 SD-21275-01, Fig. 2  
 SD-21201-01, Fig. 15  
 SD-21318-01, Fig. 6

It is not anticipated that any additional miscellaneous alarms of any of the above types will be required, except in the case of a new floor of equipment being added.

#### Cable and Wire

4.23 22 type "C" wire shall be used for the local wiring at the relay rack and any additional local cable wires required in the sender make busy frame, DSA switchboard, trouble desk, or floor and main alarm boards. A 182CL cable shall be run from the sender load indicating equipment on the relay rack to each sender frame containing senders that use a break contact to indicate a busy condition or are in a sender group with some of the above senders. Wires between frames shown on Fig. 1 shall be 20 gauge type "F" wire.

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