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## **Red Hat Enterprise Linux Release 9.2 Manual Pages on 'EC\_KEY\_up\_ref.3ossl' command**

**\$ man EC\_KEY\_up\_ref.3ossl**

EC\_KEY\_NEW(3ossl)            OpenSSL            EC\_KEY\_NEW(3ossl)

NAME

EVP\_EC\_gen, EC\_KEY\_get\_method, EC\_KEY\_set\_method, EC\_KEY\_new\_ex,  
EC\_KEY\_new, EC\_KEY\_get\_flags, EC\_KEY\_set\_flags, EC\_KEY\_clear\_flags,  
EC\_KEY\_new\_by\_curve\_name\_ex, EC\_KEY\_new\_by\_curve\_name, EC\_KEY\_free,  
EC\_KEY\_copy, EC\_KEY\_dup, EC\_KEY\_up\_ref, EC\_KEY\_get0\_engine,  
EC\_KEY\_get0\_group, EC\_KEY\_set\_group, EC\_KEY\_get0\_private\_key,  
EC\_KEY\_set\_private\_key, EC\_KEY\_get0\_public\_key, EC\_KEY\_set\_public\_key,  
EC\_KEY\_get\_conv\_form, EC\_KEY\_set\_conv\_form, EC\_KEY\_set\_asn1\_flag,  
EC\_KEY\_decoded\_from\_explicit\_params, EC\_KEY\_precompute\_mult,  
EC\_KEY\_generate\_key, EC\_KEY\_check\_key,  
EC\_KEY\_set\_public\_key\_affine\_coordinates, EC\_KEY\_oct2key,  
EC\_KEY\_key2buf, EC\_KEY\_oct2priv, EC\_KEY\_priv2oct, EC\_KEY\_priv2buf -  
Functions for creating, destroying and manipulating EC\_KEY objects

SYNOPSIS

```
#include <openssl/ec.h>
```

```
EVP_PKEY *EVP_EC_gen(const char *curve);
```

The following functions have been deprecated since OpenSSL 3.0, and can be hidden entirely by defining OPENSSL\_API\_COMPAT with a suitable version value, see openssl\_user\_macros(7):

```
EC_KEY *EC_KEY_new_ex(OSSL_LIB_CTX *ctx, const char *propq);
```

```
EC_KEY *EC_KEY_new(void);
```

```
int EC_KEY_get_flags(const EC_KEY *key);
```

```

void EC_KEY_set_flags(EC_KEY *key, int flags);
void EC_KEY_clear_flags(EC_KEY *key, int flags);
EC_KEY *EC_KEY_new_by_curve_name_ex(OSSL_LIB_CTX *ctx, const char *propq,
                                   int nid);
EC_KEY *EC_KEY_new_by_curve_name(int nid);
void EC_KEY_free(EC_KEY *key);
EC_KEY *EC_KEY_copy(EC_KEY *dst, const EC_KEY *src);
EC_KEY *EC_KEY_dup(const EC_KEY *src);
int EC_KEY_up_ref(EC_KEY *key);
ENGINE *EC_KEY_get0_engine(const EC_KEY *eckey);
const EC_GROUP *EC_KEY_get0_group(const EC_KEY *key);
int EC_KEY_set_group(EC_KEY *key, const EC_GROUP *group);
const BIGNUM *EC_KEY_get0_private_key(const EC_KEY *key);
int EC_KEY_set_private_key(EC_KEY *key, const BIGNUM *priv_key);
const EC_POINT *EC_KEY_get0_public_key(const EC_KEY *key);
int EC_KEY_set_public_key(EC_KEY *key, const EC_POINT *pub);
point_conversion_form_t EC_KEY_get_conv_form(const EC_KEY *key);
void EC_KEY_set_conv_form(EC_KEY *eckey, point_conversion_form_t cform);
void EC_KEY_set_asn1_flag(EC_KEY *eckey, int asn1_flag);
int EC_KEY_decoded_from_explicit_params(const EC_KEY *key);
int EC_KEY_generate_key(EC_KEY *key);
int EC_KEY_check_key(const EC_KEY *key);
int EC_KEY_set_public_key_affine_coordinates(EC_KEY *key, BIGNUM *x, BIGNUM *y);
const EC_KEY_METHOD *EC_KEY_get_method(const EC_KEY *key);
int EC_KEY_set_method(EC_KEY *key, const EC_KEY_METHOD *meth);
int EC_KEY_oct2key(EC_KEY *eckey, const unsigned char *buf, size_t len, BN_CTX *ctx);
size_t EC_KEY_key2buf(const EC_KEY *eckey, point_conversion_form_t form,
                    unsigned char **pbuf, BN_CTX *ctx);
int EC_KEY_oct2priv(EC_KEY *eckey, const unsigned char *buf, size_t len);
size_t EC_KEY_priv2oct(const EC_KEY *eckey, unsigned char *buf, size_t len);
size_t EC_KEY_priv2buf(const EC_KEY *eckey, unsigned char **pbuf);
int EC_KEY_precompute_mult(EC_KEY *key, BN_CTX *ctx);

```

`EVP_EC_gen()` generates a new EC key pair on the given curve.

All of the functions described below are deprecated. Applications should instead use `EVP_EC_gen()`, `EVP_PKEY_Q_keygen(3)`, or `EVP_PKEY_keygen_init(3)` and `EVP_PKEY_keygen(3)`.

An `EC_KEY` represents a public key and, optionally, the associated private key. A new `EC_KEY` with no associated curve can be constructed by calling `EC_KEY_new_ex()` and specifying the associated library context in `ctx` (see `OSSL_LIB_CTX(3)`) and property query string `propq`.

The `ctx` parameter may be `NULL` in which case the default library context is used. The reference count for the newly created `EC_KEY` is initially set to 1. A curve can be associated with the `EC_KEY` by calling `EC_KEY_set_group()`.

`EC_KEY_new()` is the same as `EC_KEY_new_ex()` except that the default library context is always used.

Alternatively a new `EC_KEY` can be constructed by calling `EC_KEY_new_by_curve_name_ex()` and supplying the nid of the associated curve, the library context to be used `ctx` (see `OSSL_LIB_CTX(3)`) and any property query string `propq`. The `ctx` parameter may be `NULL` in which case the default library context is used. The `propq` value may also be `NULL`. See `EC_GROUP_new(3)` for a description of curve names. This function simply wraps calls to `EC_KEY_new_ex()` and `EC_GROUP_new_by_curve_name_ex()`.

`EC_KEY_new_by_curve_name()` is the same as `EC_KEY_new_by_curve_name_ex()` except that the default library context is always used and a `NULL` property query string.

Calling `EC_KEY_free()` decrements the reference count for the `EC_KEY` object, and if it has dropped to zero then frees the memory associated with it. If `key` is `NULL` nothing is done.

`EC_KEY_copy()` copies the contents of the `EC_KEY` in `src` into `dest`.

`EC_KEY_dup()` creates a new `EC_KEY` object and copies `ec_key` into it.

`EC_KEY_up_ref()` increments the reference count associated with the `EC_KEY` object.

`EC_KEY_get0_engine()` returns a handle to the `ENGINE` that has been set

for this EC\_KEY object.

EC\_KEY\_generate\_key() generates a new public and private key for the supplied eckey object. eckey must have an EC\_GROUP object associated with it before calling this function. The private key is a random integer ( $0 < \text{priv\_key} < \text{order}$ , where order is the order of the EC\_GROUP object). The public key is an EC\_POINT on the curve calculated by multiplying the generator for the curve by the private key.

EC\_KEY\_check\_key() performs various sanity checks on the EC\_KEY object to confirm that it is valid.

EC\_KEY\_set\_public\_key\_affine\_coordinates() sets the public key for key based on its affine co-ordinates; i.e., it constructs an EC\_POINT object based on the supplied x and y values and sets the public key to be this EC\_POINT. It also performs certain sanity checks on the key to confirm that it is valid.

The functions EC\_KEY\_get0\_group(), EC\_KEY\_set\_group(), EC\_KEY\_get0\_private\_key(), EC\_KEY\_set\_private\_key(), EC\_KEY\_get0\_public\_key(), and EC\_KEY\_set\_public\_key() get and set the EC\_GROUP object, the private key, and the EC\_POINT public key for the key respectively. The function EC\_KEY\_set\_private\_key() accepts NULL as the priv\_key argument to securely clear the private key component from the EC\_KEY.

The functions EC\_KEY\_get\_conv\_form() and EC\_KEY\_set\_conv\_form() get and set the point\_conversion\_form for the key. For a description of point\_conversion\_forms please see EC\_POINT\_new(3).

EC\_KEY\_set\_flags() sets the flags in the flags parameter on the EC\_KEY object. Any flags that are already set are left set. The flags currently defined are EC\_FLAG\_NON\_FIPS\_ALLOW and EC\_FLAG\_FIPS\_CHECKED.

In addition there is the flag EC\_FLAG\_COFACTOR\_ECDH which is specific to ECDH. EC\_KEY\_get\_flags() returns the current flags that are set for this EC\_KEY. EC\_KEY\_clear\_flags() clears the flags indicated by the flags parameter; all other flags are left in their existing state.

EC\_KEY\_set\_asn1\_flag() sets the asn1\_flag on the underlying EC\_GROUP object (if set). Refer to EC\_GROUP\_copy(3) for further information on

the `asn1_flag`.

`EC_KEY_decoded_from_explicit_params()` returns 1 if the group of the key was decoded from data with explicitly encoded group parameters, -1 if the key is NULL or the group parameters are missing, and 0 otherwise.

`EC_KEY_precompute_mult()` stores multiples of the underlying `EC_GROUP` generator for faster point multiplication. See also `EC_POINT_add(3)`.

Modern versions should instead switch to named curves which OpenSSL has hardcoded lookup tables for.

`EC_KEY_oct2key()` and `EC_KEY_key2buf()` are identical to the functions `EC_POINT_oct2point()` and `EC_POINT_point2buf()` except they use the public key `EC_POINT` in `ekey`.

`EC_KEY_oct2priv()` and `EC_KEY_priv2oct()` convert between the private key component of `ekey` and octet form. The octet form consists of the content octets of the privateKey OCTET STRING in an `ECPrivateKey` ASN.1 structure.

The function `EC_KEY_priv2oct()` must be supplied with a buffer long enough to store the octet form. The return value provides the number of octets stored. Calling the function with a NULL buffer will not perform the conversion but will just return the required buffer length.

The function `EC_KEY_priv2buf()` allocates a buffer of suitable length and writes an `EC_KEY` to it in octet format. The allocated buffer is written to `*pbuf` and its length is returned. The caller must free up the allocated buffer with a call to `OPENSSL_free()`. Since the allocated buffer value is written to `*pbuf` the `pbuf` parameter MUST NOT be NULL.

`EC_KEY_priv2buf()` converts an `EC_KEY` private key into an allocated buffer.

## RETURN VALUES

`EC_KEY_new_ex()`, `EC_KEY_new()`, `EC_KEY_new_by_curve_name_ex()`, `EC_KEY_new_by_curve_name()` and `EC_KEY_dup()` return a pointer to the newly created `EC_KEY` object, or NULL on error.

`EC_KEY_get_flags()` returns the flags associated with the `EC_KEY` object as an integer.

`EC_KEY_copy()` returns a pointer to the destination key, or NULL on

error.

EC\_KEY\_get0\_engine() returns a pointer to an ENGINE, or NULL if it wasn't set.

EC\_KEY\_up\_ref(), EC\_KEY\_set\_group(), EC\_KEY\_set\_public\_key(), EC\_KEY\_precompute\_mult(), EC\_KEY\_generate\_key(), EC\_KEY\_check\_key(), EC\_KEY\_set\_public\_key\_affine\_coordinates(), EC\_KEY\_oct2key() and EC\_KEY\_oct2priv() return 1 on success or 0 on error.

EC\_KEY\_set\_private\_key() returns 1 on success or 0 on error except when the priv\_key argument is NULL, in that case it returns 0, for legacy compatibility, and should not be treated as an error.

EC\_KEY\_get0\_group() returns the EC\_GROUP associated with the EC\_KEY.

EC\_KEY\_get0\_private\_key() returns the private key associated with the EC\_KEY.

EC\_KEY\_get\_conv\_form() return the point\_conversion\_form for the EC\_KEY.

EC\_KEY\_key2buf(), EC\_KEY\_priv2oct() and EC\_KEY\_priv2buf() return the length of the buffer or 0 on error.

#### SEE ALSO

EVP\_PKEY\_Q\_keygen(3) crypto(7), EC\_GROUP\_new(3), EC\_GROUP\_copy(3), EC\_POINT\_new(3), EC\_POINT\_add(3), EC\_GFp\_simple\_method(3), d2i\_ECPKParameters(3), OSSL\_LIB\_CTX(3)

#### HISTORY

EVP\_EC\_gen() was added in OpenSSL 3.0. All other functions described here were deprecated in OpenSSL 3.0. For replacement see EVP\_PKEY-EC(7).

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